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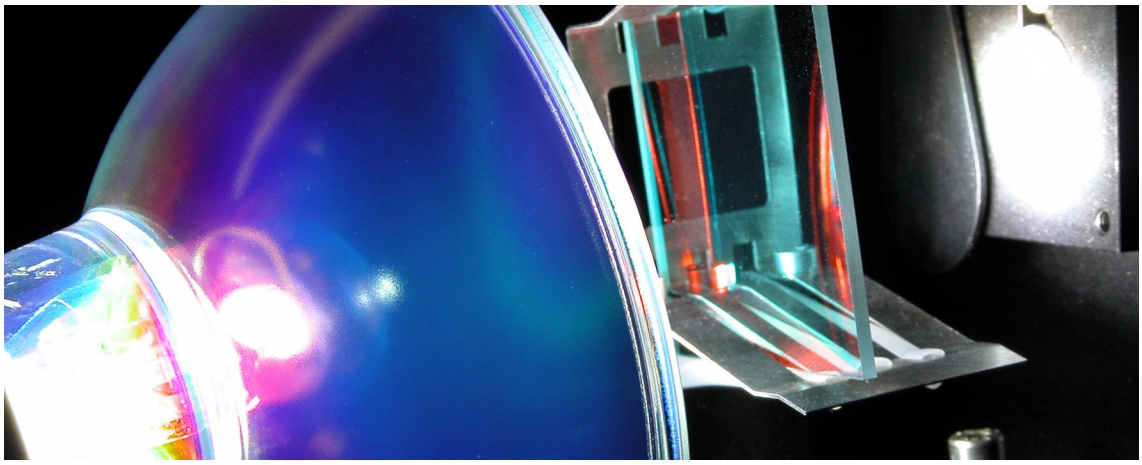

HQI® ILLUMINATION MODULE SERVICE MANUAL AND TROUBLESHOOTING GUIDE

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This Manual

This manual is designed to give service instructions and troubleshooting information for the Basler SENSIC HQ®I illumination module.

It contains important information on how to service the illumination module safely, properly and most efficiently. Observing the manual helps to avoid danger, to reduce repair costs and downtime and to increase the reliability and life time of the light source.

The manual must be read and applied by any person who sets up, services or troubleshoots the illumination module. The manual must always be available wherever the lillumination module is in use.

For a full description of the Basler SENSIC inspection system and its capabilities, this document must be used together with the Basler SENSIC hardware operating manual, software operating manual, service manual and troubleshooting guide.

Warranty

Basler AG is not liable for damage caused as a consequence of disregarding this manual! In addition, the warranty may become void.

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1 Safety Instructions

1.1 Conventions Used in This Manual

The following symbols are used for safety instructions and other important notes:

	Danger Refers to orders and prohibitions designed to prevent injury or extensive damage.
	Danger **TOXIC MATERIAL** Refers to orders and prohibitions designed to prevent injury caused by toxic material.
	Danger Refers to orders and prohibitions designed to prevent injury caused by touching hot surfaces.
	Danger Refers to orders and prohibitions designed to prevent injury or extensive damage caused by high electric voltage.
	Danger Refers to orders and prohibitions designed to prevent injury caused by bright light.
	Caution Refers to special information and/or orders and prohibitions directed towards preventing damage.
	Note: Provides special information on how to use the system most efficiently.

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1.2 Designated Use

The illumination module is exclusively designed to be used in a Basler SENSIC inspection system. Using the illumination modules for purposes other than those mentioned above is considered contrary to its designated use. The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of any misuse lies entirely with the user. Operating the illumination module within the limits of its designated use also involves observing the instructions set out in this manual and complying with the maintenance directives.

1.3 Electric Shock

Danger

ELECTRIC SHOCK

To avoid the danger of electric shock, the following safety measures must be observed:

- Turn off and lock out system power immediately if a fault occurs in the electric system.
- Turn off and lock out system power before you start maintenance, service or repair. Never work on the electric system with power switched on. Contact with open cables will cause electric shock.
- Melting fuses before the main switches remain under power when the main switch is switched off. Contact may cause death, electric shock or burn. Turn off and lock out system power before servicing.
- Work on the electric system or equipment must only be carried out by a skilled electrician or by specially instructed personnel under the control and supervision of an electrician and in accordance with the applicable electric engineering rules.

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1.4 Health Risk in Case of HQI® Lamp Breakage

Danger

TOXIC MATERIAL

The inspection system is equipped with metal halide lamps (HQI lamps) in which the discharge arc burns at high pressure in an atmosphere of halogen and mercury vapour and rare earths. The wattage of an HQI lamp is 150W. A 150W HQI lamp contains a maximum of 15 mg mercury. To avoid health risk in case of lamp breakage, observe the following safety instructions.

HEALTH RISK

Never inhale, swallow or get in skin contact with mercury or mercury compounds. Inhaling mercury or mercury compounds in vapour or powder form can lead to health problems. Mercury can also be absorbed through the skin.

Only operate the lamp if the bulb is intact. If broken, intensive UV radiation will be released and damage your eye or skin.

PROTECTION AGAINST LAMP BREAKAGE

To avoid health risks, the manufacturer recommends the following procedure in the event of a lamp exploding or lamp breakage:

- Everyone in the immediate vicinity should leave the room as quickly as possible to avoid inhaling mercury vapour.
- The room should be carefully ventilated for 20 to 30 minutes at least.
- Once the luminaire has cooled down and certainly before it is used again, all residual mercury must be thoroughly removed from the inside of the luminaire.

  To avoid contact with the skin, use disposable gloves. Clear up liquid mercury using a cloth dampened with a commercial adsorption agent that contains a tenside. See Section 1.5 on page 4 for disposal information.

FIRST AID

If you inhale, swallow or get in skin contact with mercury or mercury compounds, observe the following first aid measures:

- First aid personnel: Avoid contact with mercury or mercury compounds.
- After inhalation: Fresh air. If required, artificial respiration. Immediately consult a doctor.
- After skin contact: Wash the mercury off with much water. Remove contaminated clothes.
- After eye contact: Wash the mercury off while you keep your eyelid open (15 minutes). Immediately consult an eye specialist.
- After swallowing: If conscious, drink a lot of water, trigger a vomit. Immediately consult a doctor.

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1.5 Disposal of HQI® Lamps

Danger

DISPOSAL

Since metal halide lamps contain noxious substances (particularly mercury) they have to be disposed of in Europe as special waste under

EWC Code 20 01 21* "Fluorescent tubes and other mercury-containing waste"

Metal halide lamps therefore have to be transported to special waste disposal facilities. In other countries, the relevant national regulations must be followed.

Do not allow mercury to pour into water, exhaust water or earth.

1.6 Hot Surface

Danger

HOT SURFACE

Do not touch the illumination modules in the area around the fibre cable connector (Fig. 1). The area can reach a temperature of more than **70° C**.

Parts of the HQI lamp can reach a temperature of several **100°C**. Make sure that at least **30 minutes** have passed from system shutdown before you open the housing and touch the lamps.

Fig. 1: Hot Area Around Fibre Cable Connectors

1.7 Bright Light

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

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1.8 Maintenance, Service and Repairs

Danger

QUALIFICATION REQUIRED

To avoid injury, make sure that maintenance and service are performed by qualified technicians only.

Repair must be performed by Basler Technical Service at the Basler factory only.

1.9 Spare Parts

Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied on to do so.

For spare part information, please contact Basler Technical Support. The support addresses appear on the back of the title page of this manual.

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2 Functional Description

2.1 General

HQI illumination modules are based on HQI lamps, whose light is conducted to the substrate via an interfacing fiber cable.

HQI stands for the chemical elements Mercury (**H**g) Quartz (**Q**) and Iodide (**I**).

An HQI lamp uses a high voltage arc in a gas filled environment to produce light. It consists of an outer glass shield surrounding two voltage rails connecting to each end of a smaller bulb containing the gas. A rod running through both ends of the smaller bulb connects the two voltage rails with each other.

The power for the HQI lamp is delivered by a large capacitor and a transformer to enable a constant very high voltage to create the arc in the smaller bulb.

2.2 Technical Specifications of HQI Lamp

wattage	150 W
bulb	R30
operating time	approx. 9,000 h
base type	AMP Universal Mate-N- Lock
color temperature	4,200 K
initial lumens	11,000
lumen output with 25 mm aperture	5,200
operating voltage (rated)	95 V
operating current (rated)	1.8 A

Table 1: Technical Specifications of HQI Lamp

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2.3 Basic Operation

The HQI illumination module serves as light source for various types of visual quality control. It offers the possibility of closed loop control and can be parameterized via CAN bus messages.

Additionally, in bright field illumination application, the illumination module comprises a switchable shutter blade which can be set with CAN bus messages, too.

The Basler SENSIC software (release 8.0 and later) supports the HQI illumination module. When starting the **Line Scan Controller** software, it sets the parameters given in the machine parameter set and switches on all lamps stated in the machine parameter set.

Fig. 2: Line Scan Controller

Fig. 2: For service purposes, select the **Illumination** button in **Line Scan Controller.** An **Illumination Control** window will appear which, among other things, displays the intensity, operating time, temperature and the output control voltage of the illumination modules. You can also switch lamps and shutters in the **Illumination Control** window.

For details on the **Illumination Control** window, refer to Section 7 on page 33.

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2.3.1 Filters

The illumination module can be equipped with up to three optical filters in order to adapt the wave length characteristics of the light.

In the bright field illumination application, a Calflex B1/K1 IR cut filter is inserted at position 1 and a diffusor at position 2 by default (for details refer to Section 3.3 on page 16).

2.3.2 Temperature Control

To avoid damage to the fiber connector of the illumination module due to excessive heat, a temperature sensor is located close to the fiber connector. This sensor switches the HQI lamp off as soon as the temperature at the sensor reaches 100° C.

2.3.3 Intensity Control

You can vary the intensity of the HQI lamp between 85% and 125%. A photo diode located close to the fiber connector measures the actual output intensity.

2.3.4 Closed Loop Control

When closed loop control is switched on, the signal of the intensity sensor is compared with the target value by a PI control unit which calculates the control signal for the HQI lamp's power supply unit.

When closed loop control is switched off, you can set the control signal for the HQI lamp's power supply unit directly.

2.3.5 Status LEDs

The illumination module permanently monitors its own operational status. For details refer to Section 3.1.3 on page 14.

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3 Hardware Components

The HQI illumination module consists of the following components.

3.1 Where to Find Which Component

3.1.1 Internal Components

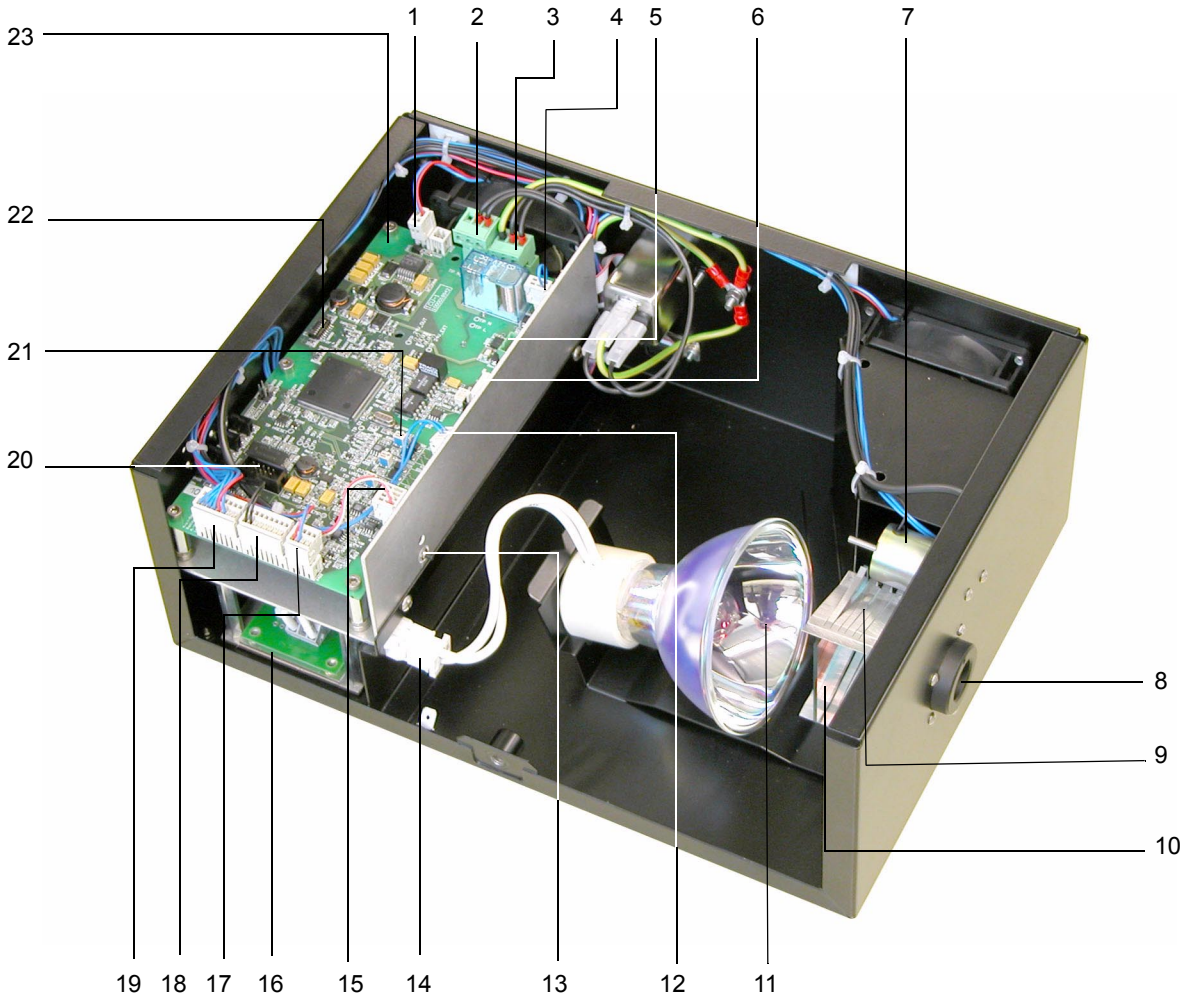

Fig. 3: Internal Components (Top View)

(1) 24 V DC power supply for fan no. 1.
(2) 230 V power out (to the power supply unit).
(3) 230 V power in.

(4) Shorting plug.
(5) 24 V DC additional power connection (not used).
(6) CAN bus connector (not terminated).
(7) Rotary solenoid with blade (bright field only).
(8) Fiber connection.
(9) Filter holder.
(10) IR cut filter in position 1 (bright field only).
Not shown in Fig. 3: Diffusor in position 2 (bright field only).
(11) HQI lamp.
(12) Analog input port no. 1 (intensity sensor).
(13) Operating hours reset button.
(14) Connector for HQI lamp's power supply.
(15) Analog input port no. 4 (temperature sensor).
(16) Power supply unit.
(17) Analog output port (HQI lamp power).
(18) Digital output port (shutter).
(19) Digital input port (reset status, reset operating hours, status power supply unit).
(20) RS 232 connector (only used for changing firmware).
(21) Potentiometer for adjusting the intensity sensor.
(22) Dip switch for setting the CAN mode ID.
(23) Illumination control unit (ICU). This board controls all functions of the illumination module.

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3.1.2 Fans, Fuses and Connectors

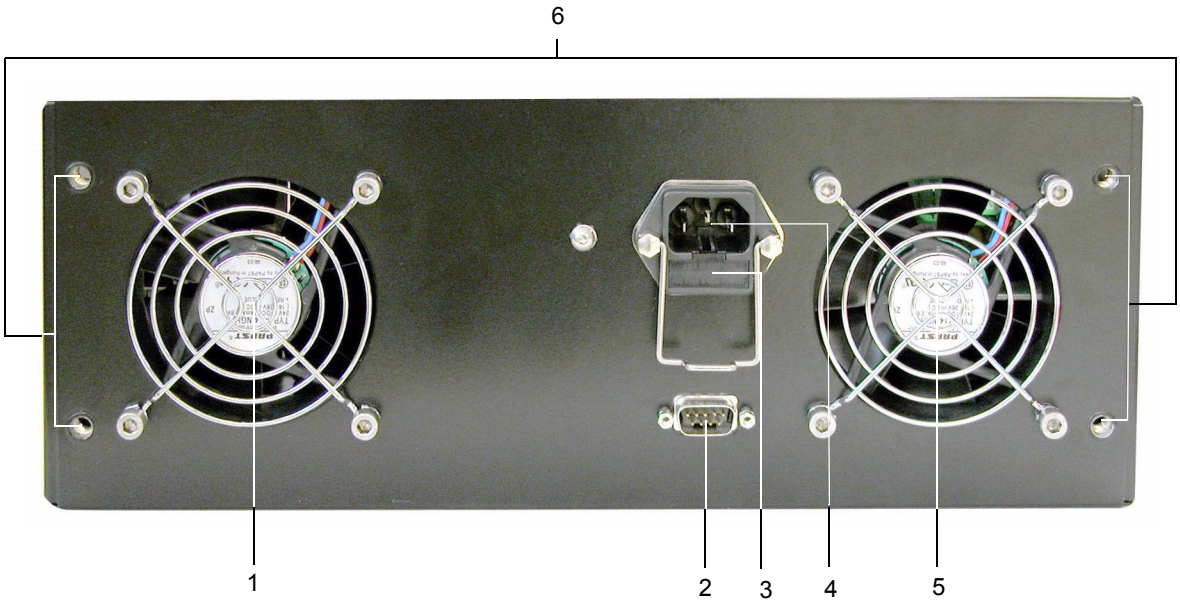

Fig. 4: Fans, Fuses and Connectors (Side View of Module)

(1) Ventilation grille for fan no. 2. The fan runs only while lamp is switched on.

(2) CAN bus socket (not terminated).

(3) Melting fuses 2.5 A (2 x), slow blowing.

(4) Mains supply connection.

(5) Ventilation grille for fan no. 1. The fan runs while power is connected to the illumination module.

(6) Threaded nuts for fastening the illumination module to a lamp box.

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3.1.3 Status LEDs

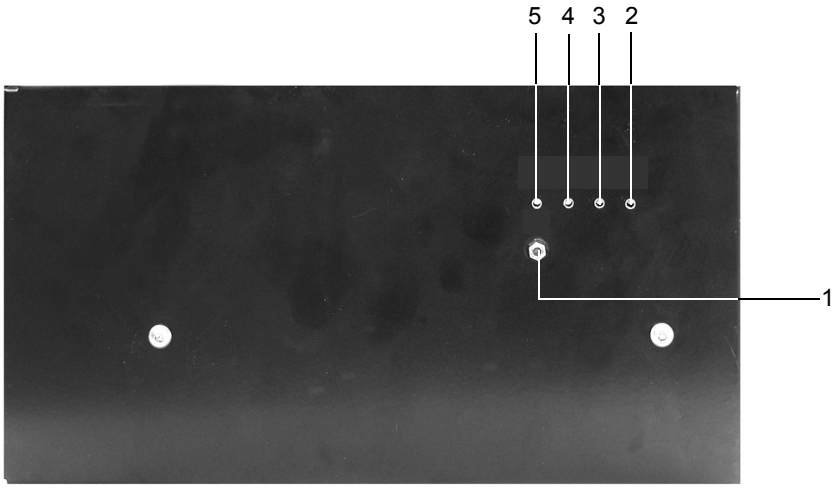

Fig. 5: Status LEDs (Side View of Module)

(1) Status reset button. (To be pressed before restarting the illumination module after an error has occurred and its cause is removed.)

(2) For future use.

(3) **Operating hours** of HQI lamp.

(4) **Temperature** close to the fiber connector.

(5) **Intensity** of HQI lamp.

For information on status indications, see Section 9.2.1 on page 63.

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3.1.4 Power Supply Unit

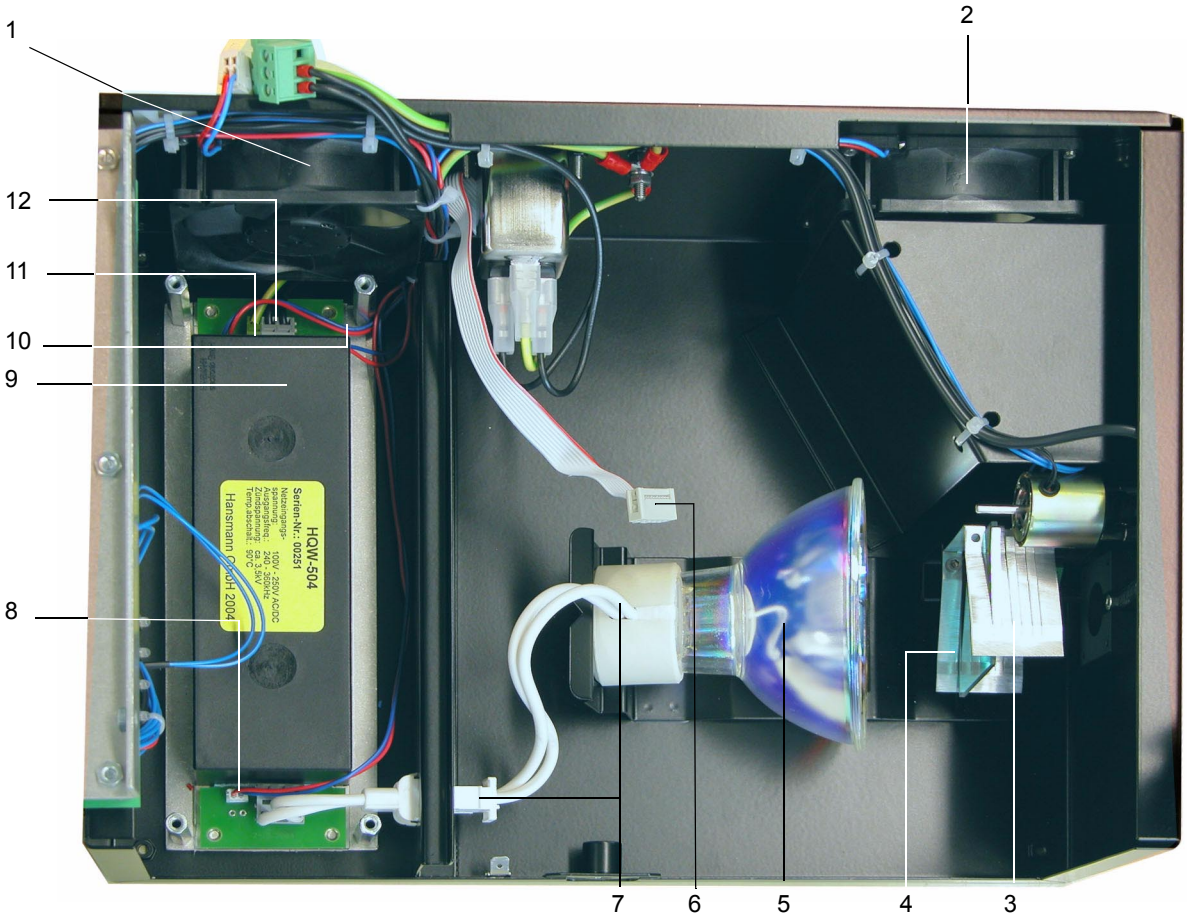

Fig. 6: Power Supply Unit (Bottom View of Module, ICU Mounting Plate Removed

(1) Fan no. 1 (blowing in outside direction).

(2) Fan no. 2 (blowing in outside direction).

(3) Filter holder.

(4) IR cut filter (bright field only) in slot no. 1.
Not shown: Diffusor (bright field only) in slot no. 2.

(5) HQI lamp.

(6) CAN bus cable.

(7) Power supply cable and connection (always mount HQI lamp with the power supply cable facing upwards).

(8) Control output port.

(9) Power supply unit.

(10) Power supply for fan no. 2.

(11) Control input port for tuning the HQI lamp's power.

(12) Power connection.

3.2 Power Supply Unit

Fig. 6: The power for the HQI lamp is supplied via the power supply unit (**7**). It supplies 330 kHz AC voltage.

The power supply unit comprises a line input port and an output port to the HQI lamp. Additionally, it features the following ports:

- a control input port (0 - 10 V),
- a 24 V output port (e.g. for a fan),
- a digital output port for the lamp status. This port is connected through when the HQI lamp is on and blocked when the HQI lamp is off.

3.3 IR Cut Filter

Fig. 7: The bright field illumination set up requires homogeneous light with a reasonable intensity and a limited spectral distribution. Therefore, a filter (**2**) is inserted into slots in a filter holder (**1**) between the HQI lamp and the fiber connector (**3**). The filter holder (**1**) has got three slots, with slot no. 1 being closest to the HQI lamp and slot no. 3 closest to the fiber connector (**3**).

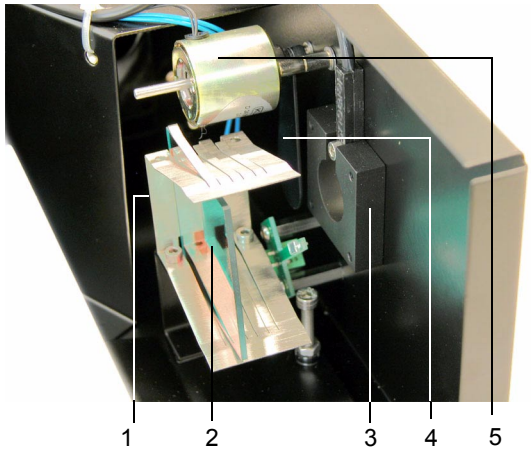

Fig. 7: IR Cut Filter and Shutter Blade

The filter used for the bright field illumination set up is a CalFlex B1/K1 filter. It is made of heat absorbing glass absorbing long wavelength IR light. Additionally, this filter comprises a dielectric mirror which reflects wavelengths longer than approximately 700 nm thus strongly reducing the thermal load of the fiber end and the intensity sensor. The thermal load of the filter itself is lower than that of absorption filters like e.g. KG2 or KG3.

In the dark field illumination set up the Cal Flex B1/K1 filter is removed to achieve a maximum intensity.

3.4 Diffusor

In the bright field application, a diffusor is used to improve the uniformity of illumination. The diffusor is normally installed in the second slot after the IR cut filter.

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3.5 Shutter

The HQI lamp can only be switched on in cold condition. This means that it requires a 10 minute cool down period after switch off before it can be switched back on. So procedures like Media Adaptation or Intensity Correction, which demand several cycles with the illumination switched on and off, would take a very long time.

Fig. 7: To overcome this drawback, a mechanical shutter is integrated inside the illumination module directly in front of the fiber connector (**3**). The mechanical shutter consists of a rotary solenoid (**5**) and a shutter blade (**4**). You can directly control the mechanical shutter with CAN bus messages:

Shutter position	Action
shutter closed	set the first digital output port to HIGH
shutter open	set the first digital output port to LOW

You can access the shutter via **Line Scan Controller**. For details, refer to Section 7 on page 33.

It is not possible to scan with shutters closed. When the scan is started (**Start** button in **Line Scan Controller** is selected), **Line Scan Controller** automatically opens all closed shutters.

3.6 Temperature Sensor

Fig. 8: To protect the illumination module from damage by overheating, it is equipped with a PT100 resistor serving as a temperature sensor (**1**). The temperature sensor is located close to the fiber connector.

Once the temperature of the sensor exceeds 100° C, the sensor triggers the following actions:

- the HQI lamp in the respective illumination module is switched off,
- the respective temperature status LED in the illumination module housing turns red,
- an error message is sent via CAN bus,
- an error message is displayed in **Event Log Viewer**.

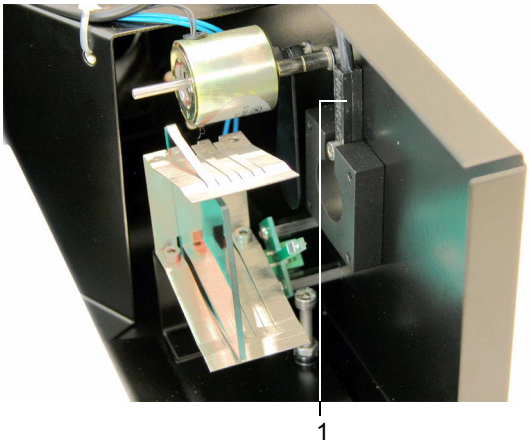

Fig. 8: Temperature Sensor

The sensor's trigger threshold of 100° C is defined in the firmware of the ICU and can be changed with SDO messages. Or by changing the associated parameter for the temperature threshold in the machine parameter set.

3.7 Fans

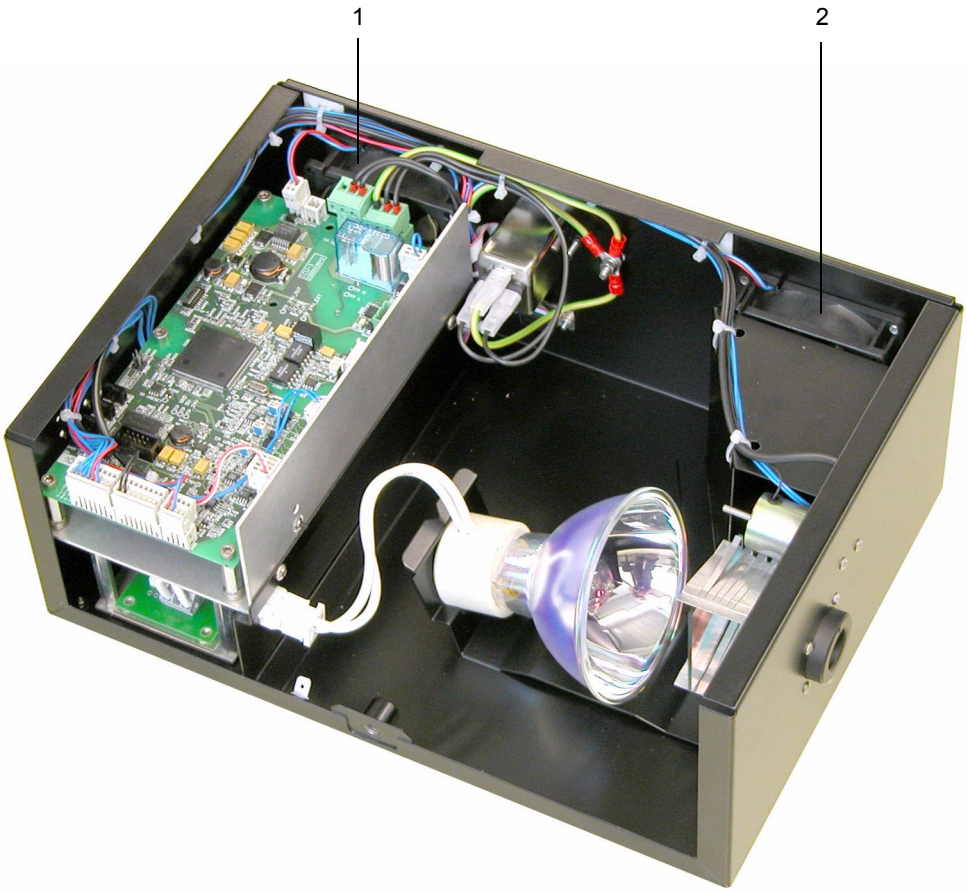

Fig. 9: Fans

Fig. 9: Each illumination module is equipped with two fans. They direct the air flow from the illumination module into the power distribution and mounting unit (lamp box). One fan (**1**) cools the following components:

- the ICU,
- the power supply unit.

This fan runs as long as the illumination module is connected to the line's mains supply.

The other fan (**2**) cools the following components:

- the fiber end,
- the filters/diffusors,
- the rotary solenoid and
- the HQI lamp.

This fan only runs while the HQI lamp is switched on, i.e. the power supply unit is connected to the line's mains supply.

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3.8 Intensity Sensor

For intensity measurement the illumination module is equipped with a silicon photo diode (BPW34) as an intensity sensor (**1**).

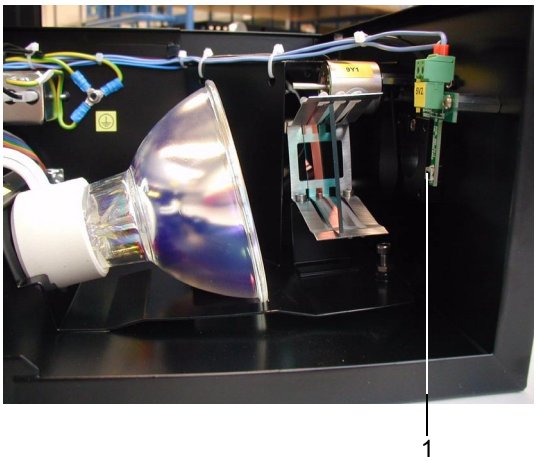

Fig. 10: Intensity Sensor

The intensity status LED (see Section 3.1.3 on page 14) displays the following intensity states measured by the intensity sensor.

LED	Status
green	Intensity OK, i.e. intensity is within the threshold parameters defined in **Parameter Set Manager**
green, flashing	HQI lamp is warming up. Hence, it has not yet reached the intensity defined by the threshold parameters
red	Intensity **not** OK, i.e. intensity is either beyond the maximum or the minimum threshold parameter

The potentiometer on the ICU responsible for the correct intensity control has already been adjusted during fabrication.

3.9 Power Distribution and Mounting Unit (Lamp Box)

Fig. 11: HQI illumination modules are mounted to a power distribution and mounting unit ("lamp box" for short). Fig. 11 shows an example.

Several illumination modules (1) are grouped to generate light. Number of modules and design of the unit vary depending on the inspection system.

The light is transported via optical fibres (not shown in Fig. 11) to the illumination bar in the sensor unit that illuminates the scan line on the substrate.

Each power distribution and mounting unit has a separate main switch (3) to connect or disconnect power to the unit.

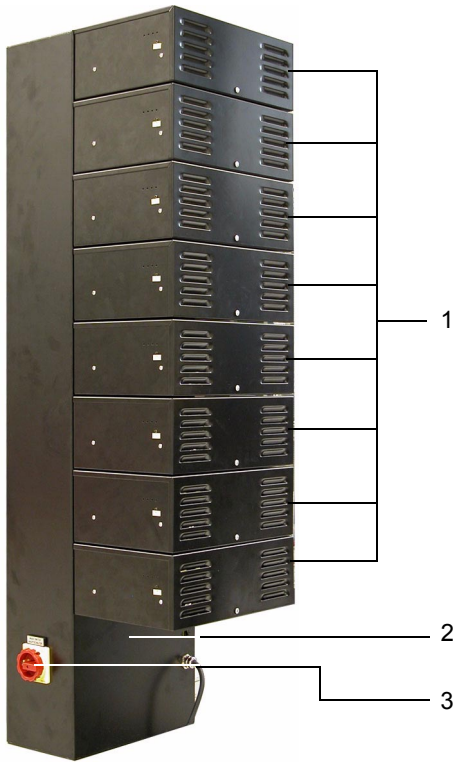

Fig. 11: Lamp Box (Example)

3.9.1 Mounting Sub-Unit

The illumination modules are fastened on the unit (2).

3.9.2 Power Distribution Sub-Unit

The illumination modules are connected to the power distribution unit (2) of the lamp box.

Fig. 12: In the power distribution unit of the illumination unit, you find the cabling for power distribution to the illumination modules.

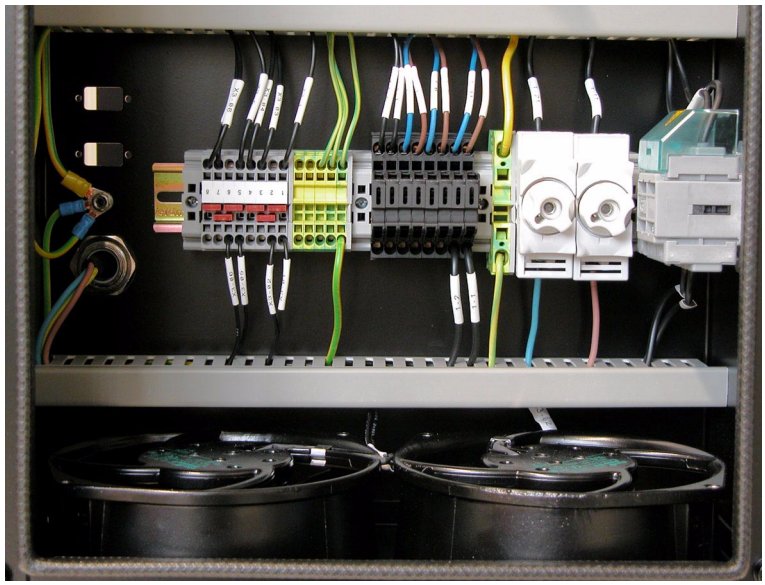

Fig. 12: Cabling (Example)

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4 Parameter Settings

The following parameter settings in the **machine parameter set** are used to control the illumination modules. An illumination module can be an HQI illumination module or a fluorescent lamp. Also see the note box on 26.

4.1 Parameter Settings

Basler SENSIC inspection systems come with a factory set of illumination control parameters that has been tested at Basler factory and normally requires no further modifications at the customer's premises. You find the parameters in the machine parameter set in the illumination category.

If modifications to the illumination control parameters are required, go through table 2 in the given order. The table is ordered by parameter UID.

Parameter	Index	Description
ILLUMINATION_MODULE_ CAN_NODE_ID	0-100; i.e. 101 illumination modules can be parameterized	CAN Node ID of illumination module. See Section 4.2 on page 26.
ILLUMINATION_MODULE_ LIGHT_GROUP	0-100; i.e. 101 illumination modules can be parameterized	Assignment of illumination module to light group. Index=ID of illumination module. Range of possible settings: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission.
LIGHT_GROUP_INTENSITY_ TARGET_VALUE	0-19; i.e. 20 groups of illumination modules can be parameterized	Intensity target value of all illumination modules of the specified light group in [decimal numbers] Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 2000. Default setting=1000. Setting depends on type of line scan station and type of lamp: • Bright field HQI lamp=640 • Fluorescent lamp= Must be adjusted to reach the right reflection-transmission ratio. • Dark field HQI lamp: 640.

Table 2: Illumination Control Parameter Settings

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Parameter	Index	Description
LIGHT_GROUP_INTENSITY_ ERROR_THRESHOLD_ MIN	0-19; i.e. 20 groups of illumination modules can be parameterized	If the intensity of an illumination module of the specified light group is lower than this threshold in [decimal numbers], an error occurs. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 2000. Default setting=800. Recommended setting=20% lower than LIGHT_GROUP_INTENSITY_TARGET_VALUE.
LIGHT_GROUP_INTENSITY_ ERROR_THRESHOLD_ MAX	0-19; i.e. 20 groups of illumination modules can be parameterized	If the intensity of an illumination module of the specified light group is higher than this threshold in [decimal numbers], an error occurs. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 2000. Default setting=1200. Recommended setting=20% higher than LIGHT_GROUP_INTENSITY_TARGET_VALUE.
LIGHT_GROUP_ TEMPERATURE_ THRESHOLD_MAX	0-19; i.e. 20 groups of illumination modules can be parameterized	If the temperature of an illumination module of the specified light group is higher than this threshold (in degrees Celsius), an error occurs. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 150. Default setting=100. Recommended setting (depends on the type of lamp): HQI lamp=100, fluorescent lamp=100. Currently no temperature sensor fluorescent lamp.

Table 2: Illumination Control Parameter Settings

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Parameter	Index	Description
LIGHT_GROUP_OPERATING_TIME_WARNING_THRESHOLD	0-19; i.e. 20 groups of illumination modules can be parameterized	If the operating time of an illumination module of the specified light group is higher than this threshold in [hours], a warning occurs. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 20000. Default setting=5000. Recommended setting (depends on the type of lamp): HQI lamp=5000, fluorescent lamp=5000.
LIGHT_GROUP_OPERATING_TIME_ERROR_THRESHOLD	0-19; i.e. 20 groups of illumination modules can be parameterized	If the operating time of an illumination module of the specified light group is higher than this threshold in [hours], an error occurs. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 20000. Default setting=6000. Recommended setting (depends on the type of lamp): HQI lamp=6000, fluorescent lamp=6000.
LIGHT_GROUP_INTENSITY_CONTROL_INTERVAL	0-19; i.e. 20 groups of illumination modules can be parameterized	Interval of the ICU control cycle in [milliseconds]. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 60000. Default setting=768. Recommended setting (depends on the type of lamp): HQI lamp=768, fluorescent lamp=0.

Table 2: Illumination Control Parameter Settings

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Parameter	Index	Description
LIGHT_GROUP_ ILLUMINATION_WARMUP_ PERIOD	0-19; i.e. 20 groups of illumination modules can be parameterized	Time in [seconds] the lamps of the specified light group need to warm up. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 1200. Default setting=120. Recommended setting=300.
LIGHT_GROUP_ ILLUMINATION_COOLDOWN _PERIOD	0-19; i.e. 20 groups of illumination modules can be parameterized	Time in [seconds] the lamps of the specified light group need to cool down. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 1,200. Default setting=300. Recommended setting (depends on the type of lamp): HQI lamp=480, fluorescent lamp=10.
LIGHT_GROUP_HEARTBEAT _INTERVAL	0-19; i.e. 20 groups of illumination modules can be parameterized	Time interval in [seconds] the ICUs of the specified light group send a heartbeat message. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 1200. Default setting=0 (Heartbeat disabled). Recommended setting=10. **Note**: It is strongly recommended to enable heartbeat messages. When disabled ("0"), the status of the light group will not be monitored. That is, no lamp failure will be reported.
LIGHT_GROUP_INTENSITY_ CONTROLLER_KP	0-19; i.e. 20 groups of illumination modules can be parameterized	Proportional parameter of control loop. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 1000. Default setting=100. Recommended setting=100.

Table 2: Illumination Control Parameter Settings

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Parameter	Index	Description
LIGHT_GROUP_INTENSITY_CONTROLLER_KI	0-19; i.e. 20 groups of illumination modules can be parameterized	Integral parameter of control loop. Index=ID of the light group: • 1=bright field reflection, • 2=bright field transmission, • 3=dark field reflection, • 4=dark field transmission. Range of possible settings: 0 to 10000. Default setting=500. Recommended setting=500.
ILLUMINATION_MODULE_INTENSITY_TARGET_VALUE_CORRECTION_FACTOR	-	For each illumination module, correction factor for the global intensity target value of the whole light group. (LIGHT_GROUP_INTENSITY_TARGET_VALUE). Used to compensate slight intensity variations from lamp to lamp. Index=ID of illumination module. Range of possible settings: 0.01 to 10.0. Default setting=1.
STATUS_INFORMATION_INTERVAL	-	Interval in [seconds] the illumination unit sends status information like current intensity value etc. Range of possible settings: 0 to 3600. Default setting=30. Recommended setting=30.

Table 2: Illumination Control Parameter Settings

4.2 Node IDs for Various Illumination Units

The table below lists the node IDs you should allocate to the HQI illumination modules when used for the various illumination units:

Illumination Module No.	**Illumination Unit**					
	Bright Field Reflection Illumination	Bright Field Transmission Illumination	Dark Field Reflection Illumination	Dark Field Transmission Illumination	Unit #3 (Future Use)	Unit #4 (Future Use
0	40	50	60	70	20	30
1	41	51	61	71	21	31
2	42	52	62	72	22	32
3	43	53	63	73	23	33
4	44	54	64	74	24	34
5	45	55	65	75	25	35
6	46	56	66	76	26	36
7	47	57	67	77	27	37
8	48	58	68	78	28	38
9	49	59	69	79	29	39
10	4A	5A	6A	7A	2A	3A
11	4B	5B	6B	7B	2B	3B
12	4C	5C	6C	7C	2C	3C
13	4D	5D	6D	7D	2D	3D
14	4E	5E	6E	7E	2E	3E
15	4F	5F	6F	7F	2F	3F

Table 3: CAN Node IDs

Note:

The counting of the illumination modules' numbers runs from bottom to top (see electric circuit diagram of the inspection system).

- With Gen5 systems, the illumination units normally comprise illumination modules #0 to #5.
- With Gen6 systems, the illumination units normally comprise illumination modules #0 to #7.
- With Gen7 systems, the illumination units normally comprise illumination modules #0 to #9.
- Using a **fluorescent lamp** for bright field transmission illumination, node ID 50 is used for the fluorescent lamp.

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5 Initial Start Up

5.1 Startup

At this stage, the illumination module is not yet installed in the power distribution and mounting unit of the sensor unit (lamp box). Proceed as follows when installing the illumination module into the lamp box for the first time:

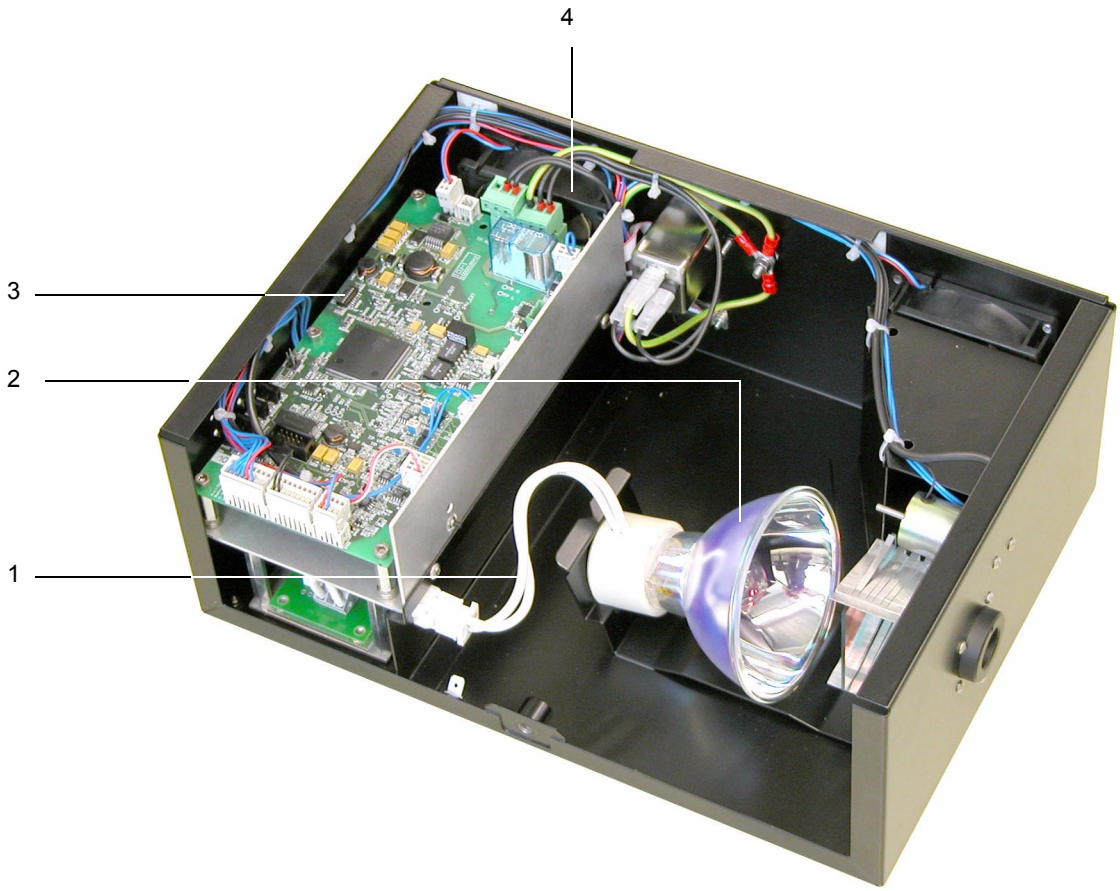

Fig. 13: Illumination Module

To start up the illumination module:

1. Open the illumination module by unlocking the quick fastening screw at the front side of the illumination module. Pull out the lid.
2. **Fig. 13:** Select CAN basic address with the DIP switch (**3**). The node ID is set with the corresponding DIP switches. The values for the individual switches are: **01 h, 02 h, 04 h, 08 h, 10 h, 20 h, 40 h, 80 h** from the front side to the rear side.

3. Check resistance value of the potentiometer for the intensity control.
4. Check whether the HQI lamp (**2**) is positioned correctly. Make sure that the lamp is installed in such a way that its mains supply cable (**1**) faces upwards, so it is not cramped under the lamp.
5. Check whether all connections fit correctly.
6. Make sure the power switch of the lamp box is switched off.
7. Open the revision opening in the lamp box.
8. Insert the illumination module into the lamp box.
9. Fasten the illumination module with 4 screws M6x12.
10. Plug the CAN bus connectors of the lamp box to the respective bushes of the illumination module (refer to the electric circuit diagram).
11. Connect the cold appliance connectors of the lamp housing to the respective bushes of the illumination module (refer to the electric circuit diagram).
12. Close the revision opening of the lamp box.
13. Close the lid of the illumination module.
14. Connect two CAN bus cables to the respective sockets of the lamp box. Alternatively, you can connect one CAN bus cable and a terminating resistor.
15. Switch the main switch of the lamp housing on. The result is the following:
    - The illumination modules go into pre-operational mode.
    - Fan no. 1 (**4**) of each illumination module is running.
    - The lamps are still out.

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5.2 How to Position the HQI Lamp

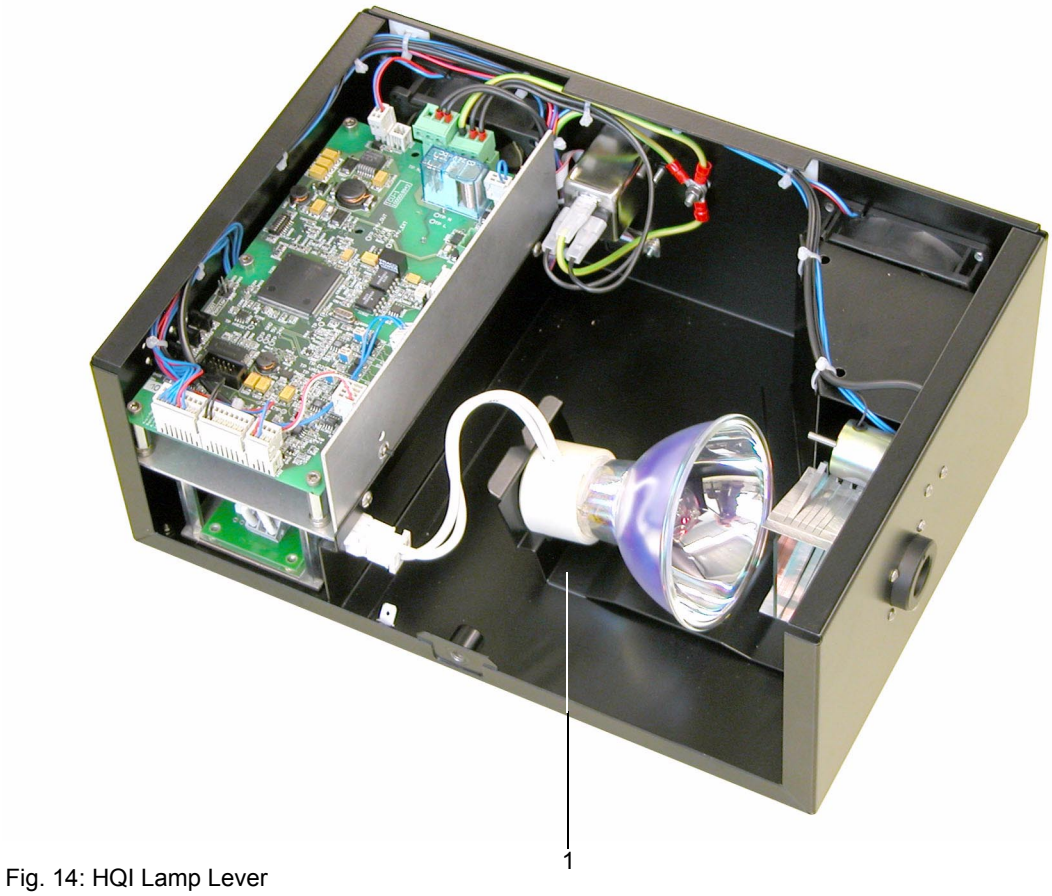

Fig. 14: HQI Lamp Lever

Each time you replace an HQI lamp make sure that it is positioned correctly.

Fig. 14: The HQI lamp is mounted on a spring lever (**1**), which allows adjusting the bulb's height to maximize the intensity of the light. You adjust the lamp with the adjustment screw under the fiber connector (**Fig. 15** (**3**)). To adjust the height, proceed as follows.

	Note: The optimal height of the HQI lamp is measured between the upper surface of the spring lever and the bottom of the illumination module housing. A deviation in the adjustment of ± 1.0 mm leads to an intensity loss of less than 1%.

How to position the bulb:

1. **Fig. 15:** Loosen the lock nut (**1**).
2. Adjust the height of the HQI bulb by turning the adjustment screw (**2**) in such a way, that the top surface of the spring lever (**Fig. 14** (**1**)) is 7.5 mm above the base plate of the HQI illumination module.
3. Tighten the lock nut to secure your settings.

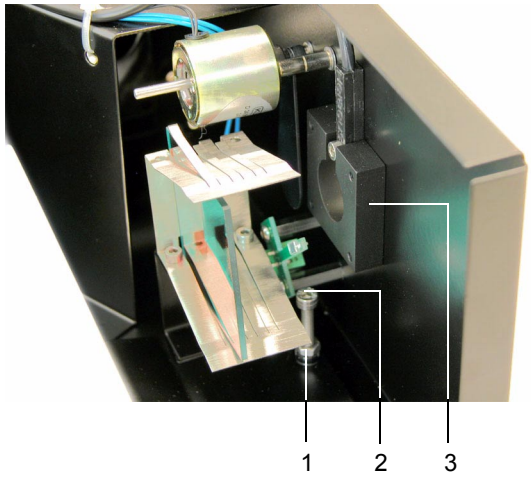

Fig. 15: HQI Lamp Adjustment Screw

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6 Operation

Note:

After switch-off HQI lamps cannot be switched back on immediately.

Allow a 10 minutes cool-down period before switching a HQI lamp on again. Hence the illumination module is equipped with mechanical shutters in case the illumination has to be interrupted only for a short while (bright field systems only).

The illumination module has two operation modes:

- pre operational mode after being switched on, i.e. only fan no. 1 is running (see **Fig. 13**, (**4**))
- operational mode. When **Line Scan Controller** is started, it automatically switches all connected illumination modules into operational mode.

In the pre operational mode, only SDO communication is possible.

In operational mode SDO, as well as PDO (process data objects) communication are possible. PDOs are required for controlling the HQI lamp (see Section 9.4.4 on page 70) and the status LEDs (see Section 9.1.2 on page 60).

During operation you only have to check the status LEDs regularly and, in case an LED indicates an error, rectify as described in Section 9 on page 59.

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7 Service

For service purposes, you can open an **Illumination Control** window on the line scan station. In this window you can view the status of all installed illumination modules and control them individually or all together.

To open the **Illumination Control** menu, select the **Illumination** button in **Line Scan Controller**.

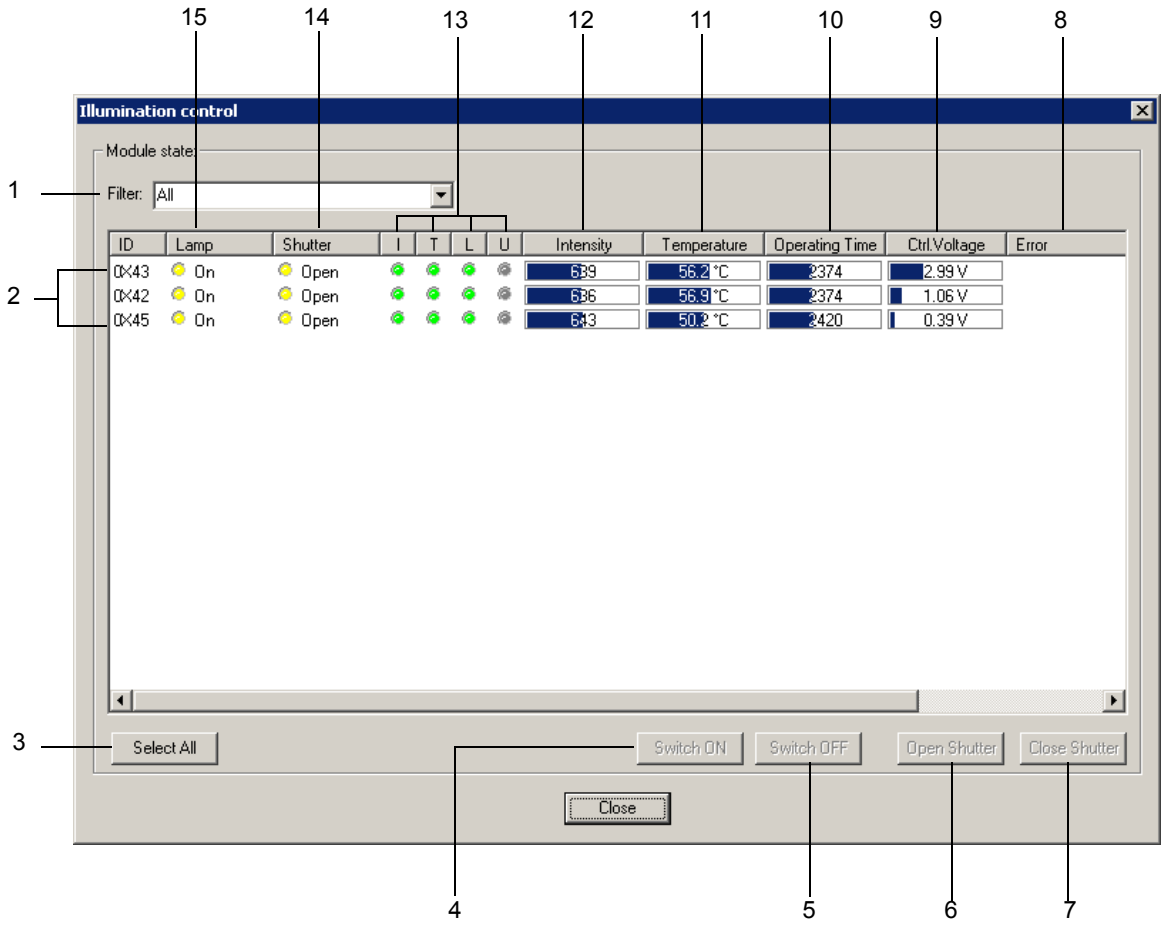

Fig. 16: Illumination Control Menu

The **Illumination Control** window offers the following functions:

(1) Select illumination module (bright field, dark field or all).

(2) CAN node IDs in hexadecimal numbers of the individual illumination modules. Once one or more illumination modules are selected, buttons **4** - **7** become active.

- Select individual illumination modules with mouse-click.
- Select groups of illumination modules by holding the <CTRL> button on the keyboard while selecting the desired illumination modules with mouse-click.

(3) Press to select all illumination modules.

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(4) Press to switch selected illumination module(s) on.

(5) Press to switch selected illumination module(s) off.

(6) Press to open shutter of selected illumination module(s).

(7) Press to close shutter of selected illumination module(s).

It is not possible to scan with shutters closed. When the scan is started (**Start** button in **Line Scan Controller** is selected), **Line Scan Controller** automatically opens all closed shutters.

(8) Error display of the illumination modules.

(9) Display of control voltage.

(10) Display of HQI lamp's operating time in per cent.

(11) Display of HQI lamp's temperature in degrees Celsius.

(12) Display of HQI lamp's intensity in per cent.

(13) Status display corresponding with the LEDs in the illumination module housing for:

- intensity (**I**)
- temperature (**T**)
- operating hours (**L**)
- earmarked for future use (**U**)

(14) Display whether shutter is open (yellow) or closed (gray).

(15) Display whether HQI lamp is switched on (yellow) or off (gray).

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8 Maintenance and Repair

8.1 Safety

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

TOXIC MATERIAL

Refers to orders and prohibitions designed to prevent injury caused by toxic material.

Danger

BURN HAZARD

Due to the powerful HQI lamp, components of the illumination module can get very hot. You can suffer serious burns if you do not let the illumination module cool down for 30 minutes before touching its components.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

Danger

QUALIFICATION REQUIRED

To avoid injury, all maintenance must be performed by qualified technicians only.

Note:

FINGER PRINTS

To avoid finger prints on the HQI lamp, make sure that you wear **gloves** when changing the lamp.

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8.2 Maintenance

The estimated life time of an HQI lamp is 9,000 hours. Frequent switching on and off can reduce the lifetime of the lamp considerably as frequent cooling down and heating up cause stress to the material.

A warning **Operating Time** message is displayed after 5,000 operating hours of the HQI lamp. This time is set by parameter. To guarantee an efficient operation of the entire system, the respective HQI lamp should be replaced shortly after the **Operating Time** warning message.

Components that have to be replaced regularly due to wear and tear are:

- HQI lamp
- fans of the illumination module
- fans of the power distribution and mounting unit that holds the illumination modules

Observe the maintenance intervals listed in table 4.

Typical Rate	What to do	See...
every 5000 to 6000 operating hours	Replace the HQI lamp.	Section 8.2.3 on page 38
every 35 000 operating hours (when operated at max. temperature) to 70 000 operating hours (room temperature)	In each **HQI illumination module** and the **power distribution and mounting unit**, replace the fans.	Section 8.2.4 on page 42 Section 8.2.5 on page 44

Table 4: Maintenance Intervals

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8.2.1 How to Remove the Illumination Module from the Lamp Box

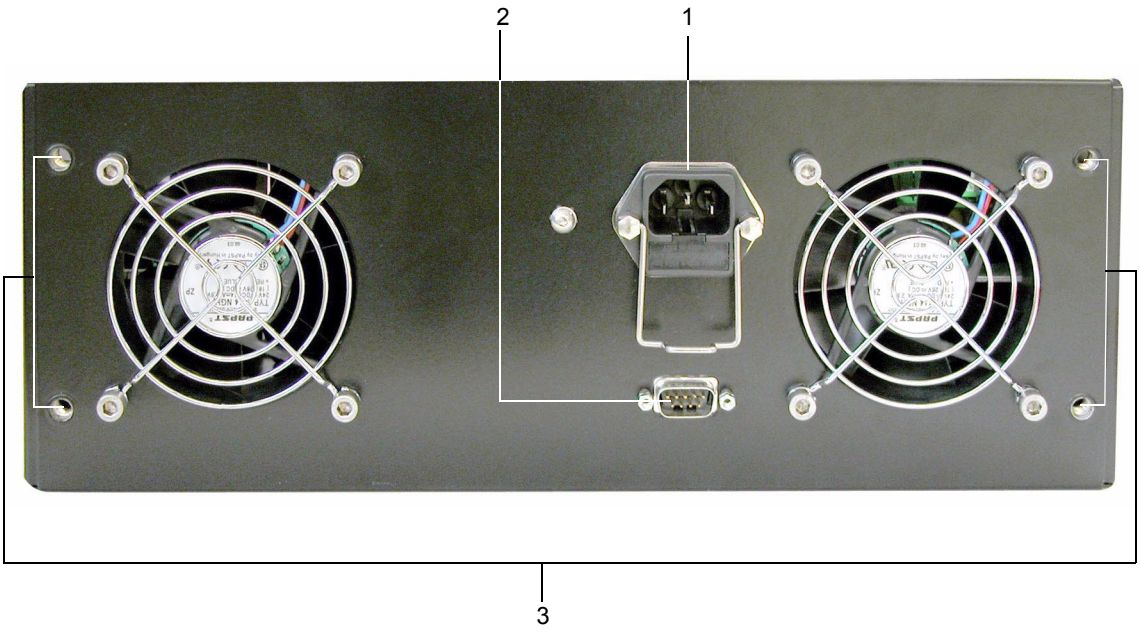

Fig. 17: Removal of Illumination Module

When changing an HQI lamp, it is necessary to remove the respective illumination module from the power distribution and mounting unit (lamp box).

To remove the module:

1. **Fig. 17:** Pull down the safety catch and remove the mains supply cable from the mains socket (**1**).
2. Unscrew the fastening screws of the CAN bus cable and remove it from the CAN bus socket (**2**).
3. Unscrew and remove the four mounting screws (**3**).
4. Carefully take the illumination module out of the power distribution and mounting unit (lamp box).

8.2.2 How to Install the Illumination Module into the Lamp Box

To install the module:

1. Carefully insert the illumination module into the power distribution and mounting unit (lamp box).
2. **Fig. 17:** Insert and fasten the four fastening screws (**3**).
3. Insert the CAN bus cable into the CAN bus socket (**2**) and fasten the fastening screws.
4. Insert the mains supply cable into the mains socket (**1**) and fasten the safety catch.

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8.2.3 How to Replace the HQI Lamp

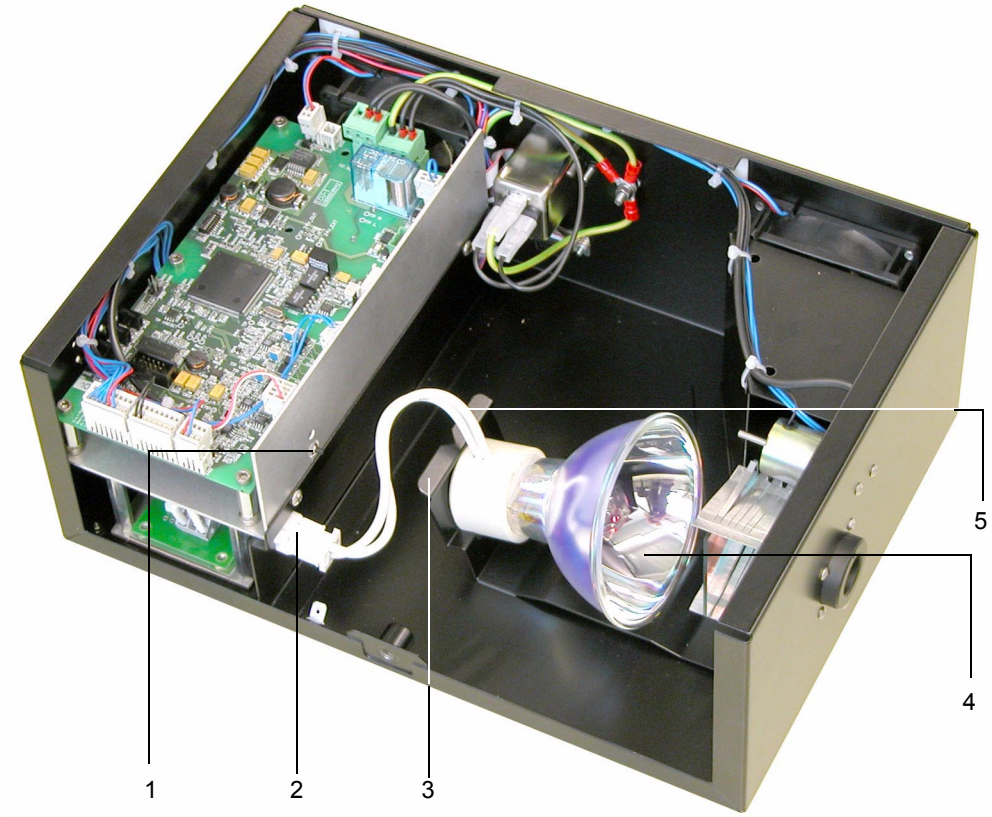

Fig. 18: Replacing the HQI Lamp

	Danger **HAZARDOUS VOLTAGE** Danger of electric shock. Turn off and lock out system power before servicing.

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Danger

TOXIC MATERIAL

The inspection system is equipped with metal halide lamps (HQI lamps) in which the discharge arc burns at high pressure in an atmosphere of halogen and mercury vapour and rare earths. The wattage of an HQI lamp is 150W. A 150W HQI lamp contains a maximum of 15 mg mercury. To avoid health risk in case of lamp breakage, observe the following safety instructions.

HEALTH RISK

Never inhale, swallow or get in skin contact with mercury or mercury compounds. Inhaling mercury or mercury compounds in vapour or powder form can lead to health problems. Mercury can also be absorbed through the skin.

Only operate the lamp if the bulb is intact. If broken, intensive UV radiation will be released and damage your eye or skin.

PROTECTION AGAINST LAMP BREAKAGE

To avoid health risks, the manufacturer recommends the following procedure in the event of a lamp exploding or lamp breakage:

- Everyone in the immediate vicinity should leave the room as quickly as possible to avoid inhaling mercury vapour.
- The room should be carefully ventilated for 20 to 30 minutes at least.
- Once the luminaire has cooled down and certainly before it is used again, all residual mercury must be thoroughly removed from the inside of the luminaire.

  To avoid contact with the skin, use disposable gloves. Clear up liquid mercury using a cloth dampened with a commercial adsorption agent that contains a tenside. See the safety advice regarding disposal on the following page for disposal information.

FIRST AID

If you inhale, swallow or get in skin contact with mercury or mercury compounds, observe the following first aid measures:

- First aid personnel: Avoid contact with mercury or mercury compounds.
- After inhalation: Fresh air. If required, artificial respiration. Immediately consult a doctor.
- After skin contact: Wash the mercury off with much water. Remove contaminated clothes.
- After eye contact: Wash the mercury off while you keep your eyelid open (15 minutes). Immediately consult an eye specialist.
- After swallowing: If conscious, drink a lot of water, trigger a vomit. Immediately consult a doctor.

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Danger

DISPOSAL

Since metal halide lamps contain noxious substances (particularly mercury) they have to be disposed of in Europe as special waste under

EWC Code 20 01 21* "Fluorescent tubes and other mercury-containing waste"

Metal halide lamps therefore have to be transported to special waste disposal facilities. In other countries, the relevant national regulations must be followed.

Do not allow mercury to pour into water, exhaust water or earth.

Danger

BURN HAZARD

Due to the powerful HQI lamp, components of the illumination module can get very hot. You can suffer serious burns if you do not let the illumination module cool down for 30 minutes before touching its components.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the HQI lamp:

1. Turn off and lock out system power.

   Repeat the below procedure for every lamp you need to replace.
2. Wait until the illumination module has cooled down. Then unlock the quarter turn fastener of the mounting unit.
3. Remove the lid of the illumination module.
4. **Fig. 18:** Disconnect the lamp plug (**2**). To avoid injuries from sharp edges of the mounting frame, use a tool like e.g. a screwdriver.
5. Push the bracket (**3**) away from the HQI lamp (**4**) with one hand and take the spent lamp out with the other.
6. Push the bracket (**3**) away from the HQI lamp holding with one hand and insert the new HQI lamp (**4**) with the other.
7. Install the HQI lamp in such a way that its mains supply cable (**5**) faces upwards.
8. Insert the mains supply cable's plug (**2**) into the respective socket.

   After you exchanged all lamps, proceed as follows:

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9. Turn the power on but leave the lamps switched off.

Danger

HIGH VOLTAGE

Danger of electric shock. Do not touch electronic boards. Parts of the electronic boards are under high voltage.

10. On each illumination module where you exchanged a lamp, press the operating hours reset button (**1**) to set the counter for the new HQI lamp back to zero.
11. Close the lid of each illumination module and fasten the quarter turn fastener.

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8.2.4 How to Replace a Fan of the Illumination Module

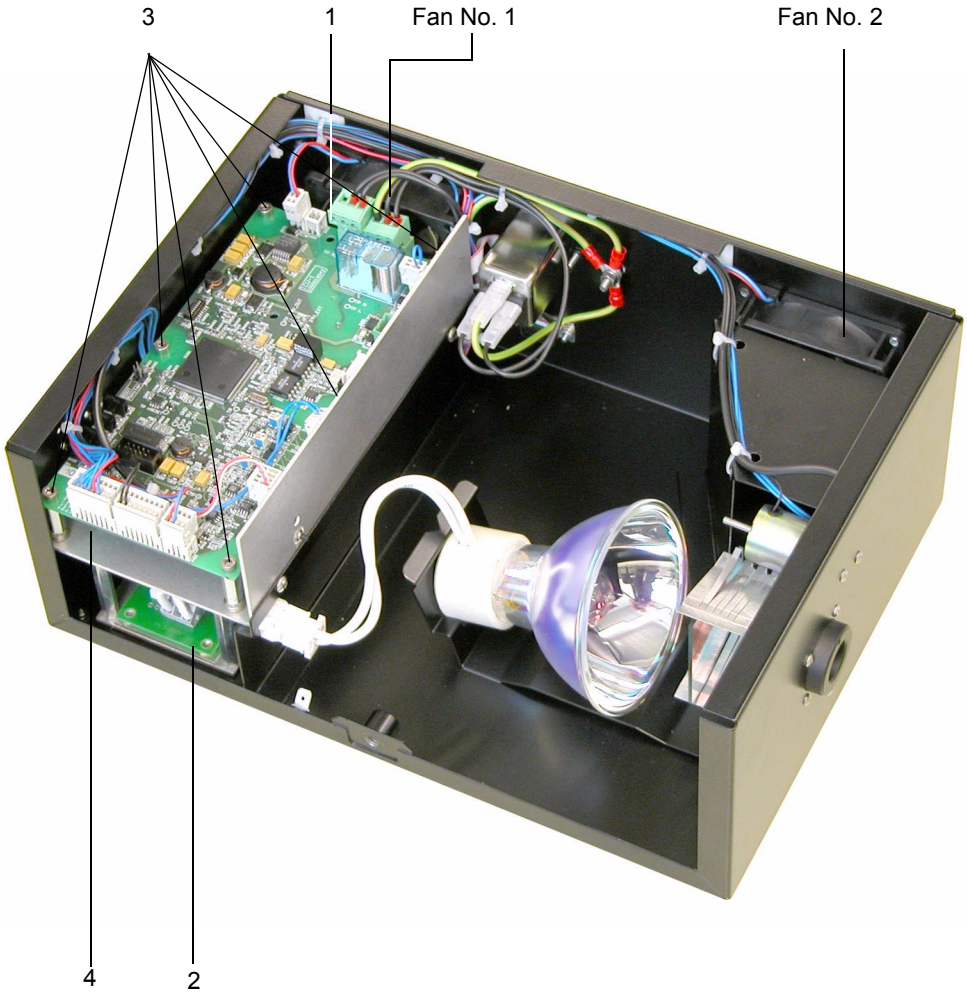

Fig. 19: Replacing a Ventilation Fan

	Danger **HAZARDOUS VOLTAGE** Danger of electric shock. Turn off and lock out system power before servicing.

	Danger **BRIGHT LIGHT** The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

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To replace a fan:

1. Turn off and lock out system power.
2. Open the servicing lid of the power distribution and mounting unit.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module whose fan you want to change.
4. Carefully unscrew the four mounting screws that connect the illumination module to the power distribution and mounting unit. Make sure the illumination module does not fall off.
5. Take the illumination module out of the power distribution and mounting unit.
6. Unfasten the quarter turn fastener and remove the service lid.
7. **Fig. 19:** Disconnect the 24 V DC power supply of the fan to be changed. The power supply connectors for both fans are on different locations in the illumination module:

   Fan no. 1 (CD001191 / SAP-No. 1000019028); the connector (**1**) is located on the ICU.

   Fan no. 2 (CD001192 / SAP-No. 1000019029); the connector is located on the power supply unit (**2**). So before disconnecting the power supply, you have to remove the ICU mounting plate (**4**) by unscrewing its six mounting screws (**3**).

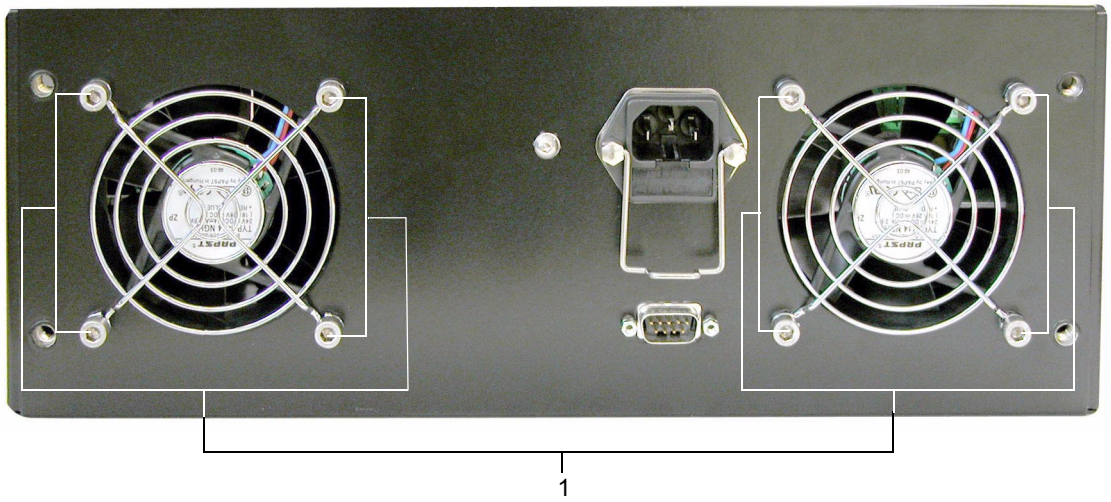

Fig. 20: Mounting Screws for the Fans at Rear Side

8. **Fig. 20:** Unscrew and remove the four mounting screws (**1**) together with the ventilation grilles of the respective fan.
9. Take out the fan and insert the new one.
10. Insert and fasten the four mounting screws (**1**) together with the ventilation grille.
11. Reconnect the 24 V DC power supply of the fan. If you have changed fan no. 2, reinstall the ICU mounting plate and fasten its six mounting screws (**Fig. 19** (**3**)).
12. Insert the lid and fasten the quarter turn fastener.
13. Insert the illumination module into the power distribution and mounting unit and fasten the mounting screws.
14. Connect the CAN bus cable.
15. Connect the mains supply.

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16. Close the service lid of the power distribution and mounting unit.
17. Turn the power on.

8.2.5 How to Replace a Fan in the Lamp Box

Fans are located inside the power distribution and mounting unit (lamp box). Their number depends on the number of HQI illumination modules installed into the system.

To replace a fan:

1. Turn off and lock out system power.
2. Remove the service lid.
3. Remove the covers from the cable ducts.
4. Disconnect the corresponding wires from their clamps (refer to the circuit diagram).
5. Dismount the fan you want to change.
6. Mount the new fan. In some cases it may become necessary to lengthen the wires to the fan (refer to the circuit diagram for the correct extension wire).
7. Connect the wires to the corresponding clamps.
8. Install the covers of the cable ducts.
9. Close the service lid.
10. Switch on power to the power distribution and mounting unit.

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8.3 Repair

Vital components may break down after extensive operation. The following sections describe how to replace these components.

Note:

REPAIRS AT BASLER FACTORY ONLY

The following instructions are for Basler Technical Service only.

All repair work must be done at Basler factory only. Do not start repair at your factory. Your warranty may become void.

8.3.1 How to Replace the Power Supply Unit

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the power supply unit:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module.
4. Carefully unscrew the four mounting screws that connect the illumination module to the lamp box. Make sure the illumination module does not fall off.
5. Take the illumination module out of the lamp box.
6. Unfasten the quarter turn fastener and remove the service lid.
7. **Fig. 19:** Remove the ICU mounting plate (**4**) by unscrewing its four mounting screws (**3**). Now you can access the power supply unit (**3**).

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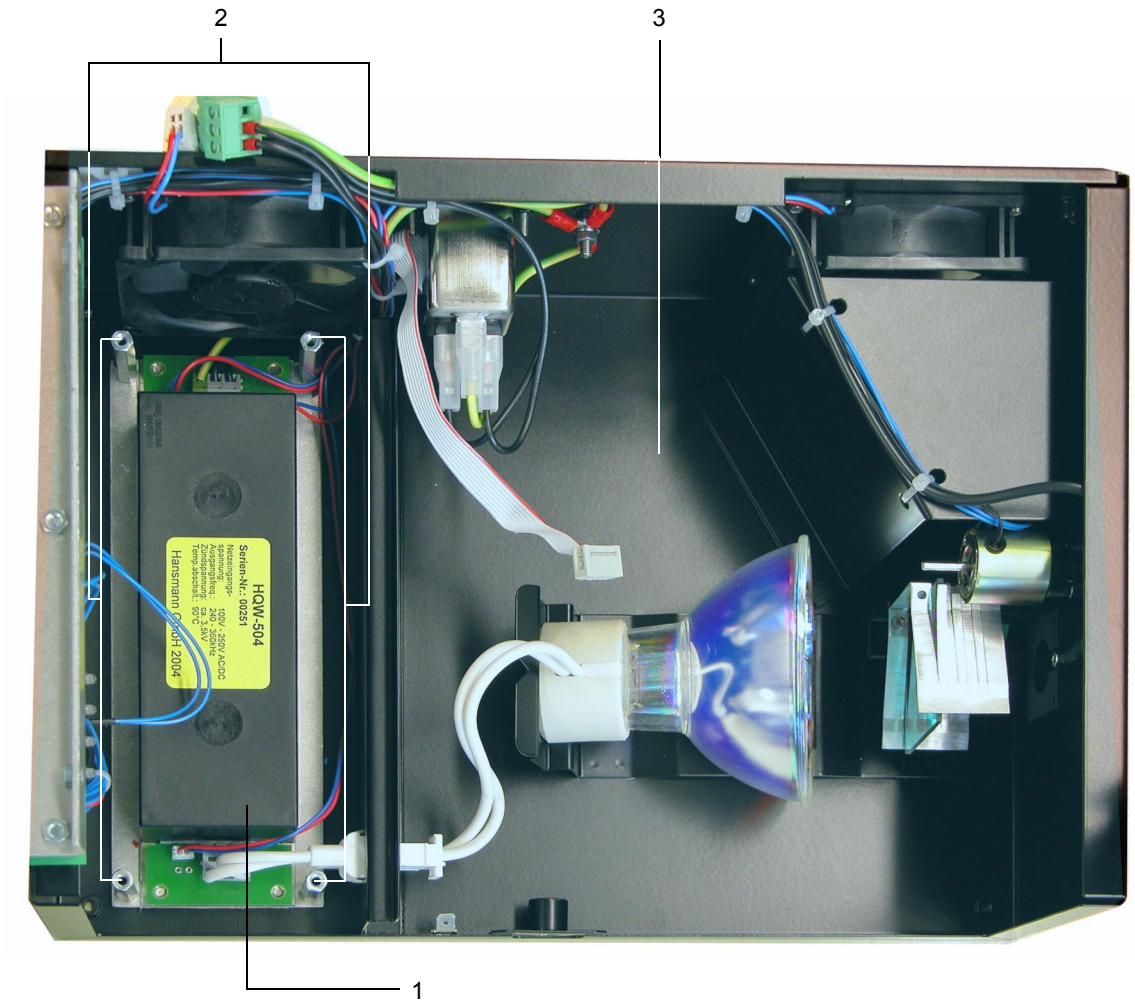

Fig. 21: Power Supply Unit

8. **Fig. 21:** Disconnect all plugs connected to the power supply unit (**1**).
9. Unscrew and remove the four standoff screws (**2**) which fasten the power supply's mounting plate to the illumination module housing (**3**).
10. Remove the power supply unit (**1**) from the illumination module housing (**3**). In case you install a power supply unit of an older making, that comes without a mounting plate, proceed as follows:
    - Remove the old power supply unit from its mounting plate.
    - Attach the new power supply unit to the mounting plate.
    - Make sure that there is a sil-pad between the power supply unit and the mounting plate.
11. Insert the new power supply unit into the illumination module.
12. Insert and fasten the four standoff screws (**2**).
13. Connect all plugs you have loosened before to the new power supply unit.
14. **Fig. 19:** Install the ICU mounting plate (**4**) in its original position.
15. Fasten the six mounting screws (**3**) of the ICU mounting plate.
16. Insert the lid and fasten the quarter turn fastener.

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17. Insert the illumination module into the lamp box and fasten the mounting screws.
18. Connect the CAN bus cable.
19. Connect the mains supply.
20. Close the service lid of the lamp box.
21. Turn the power on.

8.3.2 How to Replace the ICU

The ICU is shown in Fig. 22 (2) on 48.

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the ICU:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module.
4. Carefully unscrew the four mounting screws that connect the illumination module to the lamp box. Make sure the illumination module does not fall off.
5. Take the illumination module out of the lamp box.
6. Unfasten the quarter turn fastener and remove the service lid.

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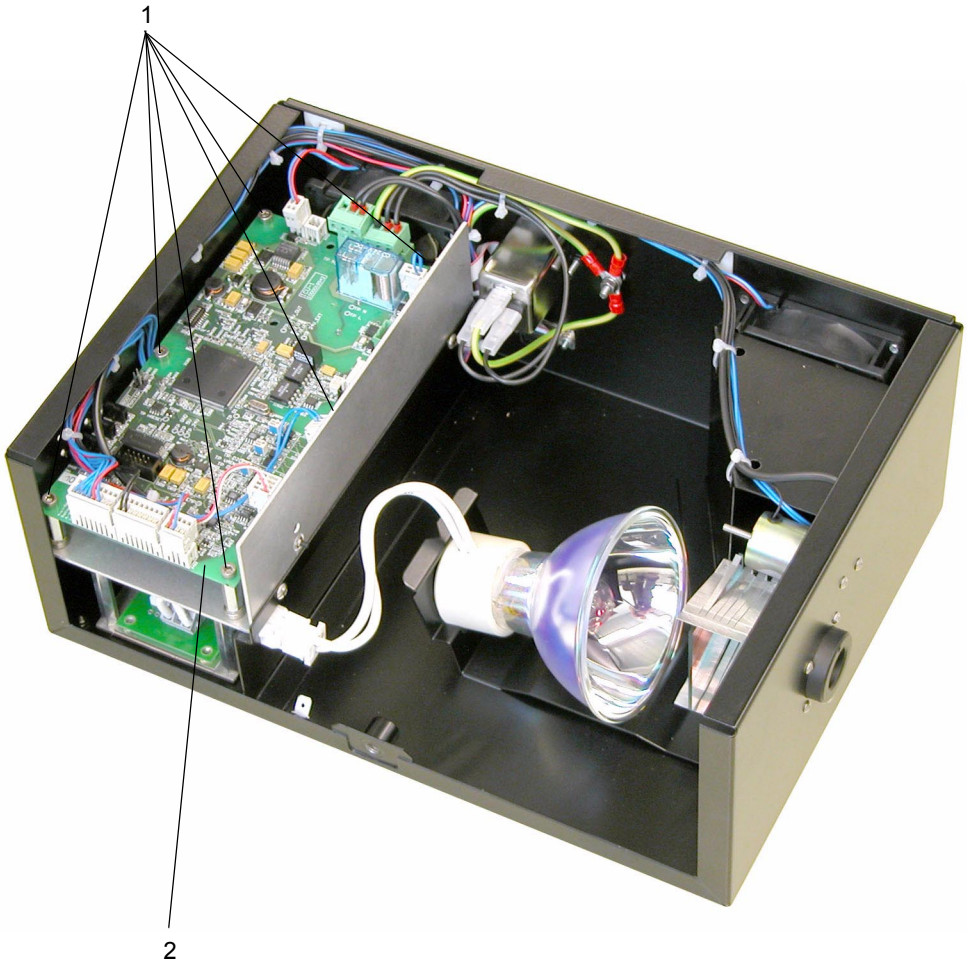

Fig. 22: Replacing the ICU

7. **Fig. 22**: Disconnect all cables from the ICU mounting (**2**).
8. Unscrew and remove the six mounting screws (**1**).
9. Remove the ICU (**2**).
10. Insert the new ICU.
11. Make sure that the DIP switch settings of the new ICU are the same as for the old ICU (identical CAN Node ID).
12. Insert and fasten the six mounting screws (**1**).
13. Connect all cables to the new ICU. Refer to the circuit diagram for correct assignment.
14. Insert the lid and fasten the quarter turn fastener.
15. Insert the illumination module into the lamp box and fasten the mounting screws.
16. Connect the CAN bus cable.
17. Connect the mains supply.
18. Close the service lid of the lamp box.
19. Lock in and turn on system power.

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8.3.3 How to Replace the Rotary Solenoid

The rotary solenoid is shown in Fig. 23 (5) on 50.

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the rotary solenoid:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module.
4. Carefully unscrew the four mounting screws that connect the illumination module to the lamp box. Make sure the illumination module does not fall off.
5. Take the illumination module out of the lamp box.
6. Unfasten the quarter turn fastener and remove the service lid.
7. **Fig. 23**: Disconnect the WAG0 8-port connector from the ICU.
8. Remove the cable ties (**1**) at the cooling duct (**2**).
9. Remove the rotary solenoid (**5**) by unscrewing the two screws (**3**) which fasten it to the illumination module housing (**6**).
10. Remove the blind from the axis of the rotary solenoid.
11. Remove the bolts from the rotary solenoid.
12. Attach the bolts to the new rotary solenoid.
13. Attach the blind to the axis of the new rotary solenoid.
14. Install the new rotary solenoid.
15. Make sure that when in active position, the blind totally covers the opening of the fiber connector (**4**).

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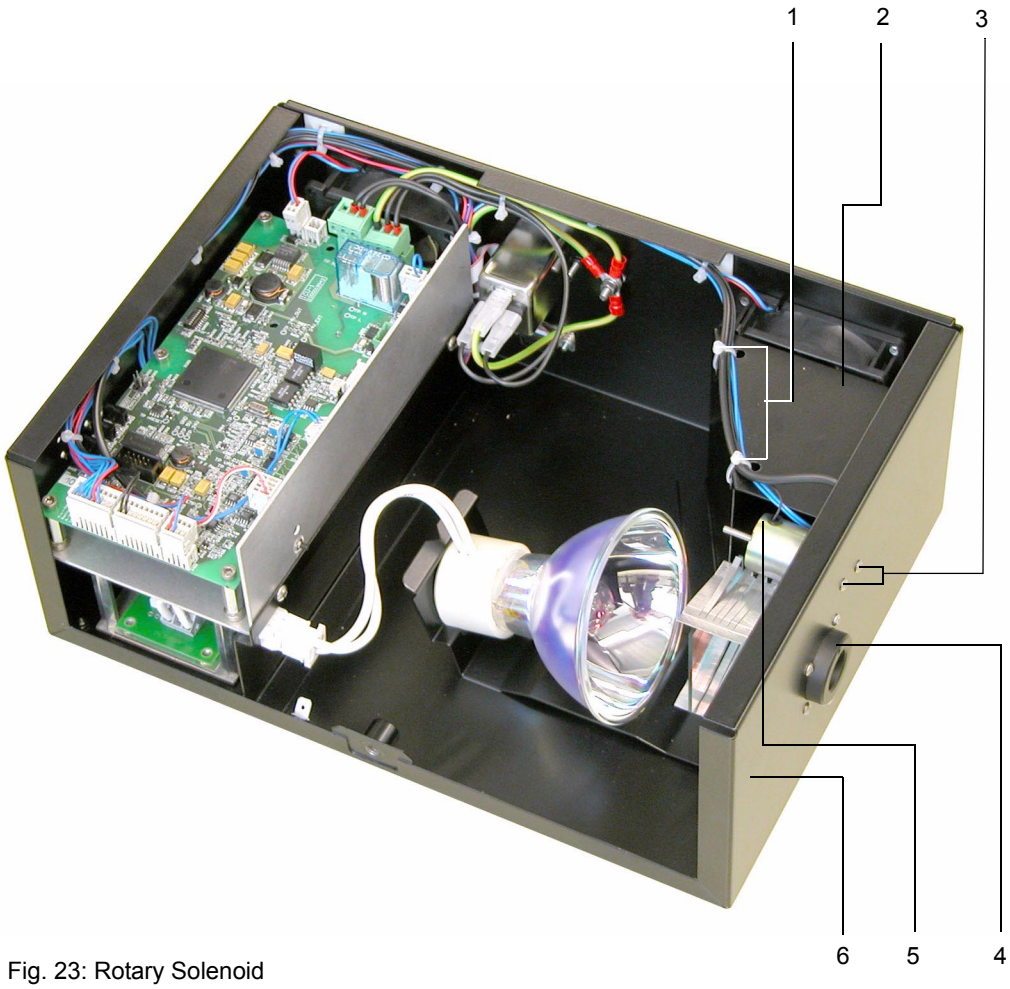

Fig. 23: Rotary Solenoid

16. Connect the WAG0 8-port connector.
17. Fasten the cables using new cable ties.
18. Insert the lid and fasten the quarter turn fastener.
19. Insert the illumination module into the lamp box and fasten the mounting screws.
20. Connect the CAN bus cable.
21. Connect the mains supply.
22. Close the service lid of the lamp box.
23. Turn the power on.

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8.3.4 How to Replace a Fuse of the Illumination Module

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

The illumination module's 2.5 A slow blowing melting fuses are located in a fuse holder (**1**) at the rear side of the illumination module, close to the mains supply connector.

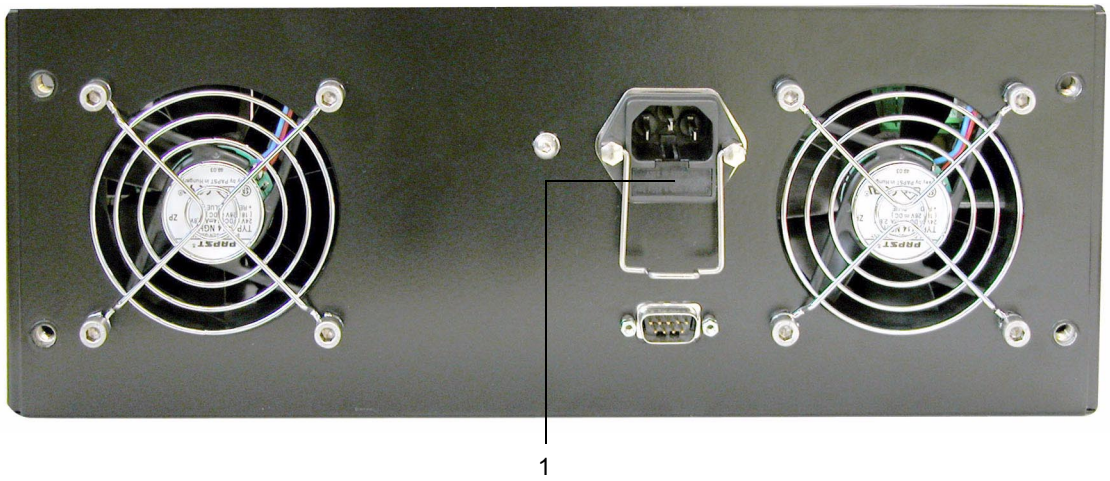

Fig. 24: Fuses

To replace a blown fuse:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable of the illumination module.
4. Open the fuse holder with the help of a screwdriver.
5. Replace the blown fuse.
6. Insert the fuse holder again.
7. Reconnect the mains supply cable.
8. Fasten the service lid.
9. Lock in and turn on system power.
10. Check whether the illumination module with the new fuse works correctly.

8.3.5 How to Replace a Fuse in the Lamp Box

The fuses of the power distribution and mounting unit (lamp box) are located inside the unit in the bottom area above the outlet fans.

To replace a fuse:

1. Turn off and lock out system power.
2. Remove the service lid.

Danger

HAZARDOUS VOLTAGE

Fuse holders remain under power even if the entire system is powered down. Contact may cause death, electric shock or burn. Turn off and lock out system power before servicing.

3. Replace the blown fuse.

Note:

Two types of fuses are applied in the power distribution and mounting unit (lamp box):

- D01 melting fuses to protect the internal wiring. They are located in front of the main switch.
- 5 x 20 mm melting fuses to protect sets of modules. They are located behind the main switch.

4. Close the service lid.
5. Lock in and turn on system power.

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8.3.6 How to Replace the Master Switch

The master switch is located in the power distribution and mounting unit (lamp box).

To replace the master switch:

1. Turn off and lock out system power.
2. Open the service lid of the lamp box.

Danger

HAZARDOUS VOLTAGE

Fuse holders remain under power even if the entire system is powered down. Contact may cause death, electric shock or burn. Turn off and lock out system power before servicing.

3. Remove both D01 fuses. Refer to the circuit diagram in the appendix of this manual.
4. Make sure that no voltage is applied to a wire connected to the master switch and disconnect all wires from the master switch.
5. Remove the rotary handle of the master switch by unscrewing its fastening screw and tearing off the handle.
6. Unscrew and remove the four mounting screws of the master switch and remove it.
7. Install the new master switch and fasten the four mounting screws.
8. Fasten the rotary handle to the new switch.
9. Connect the wires to the new master switch as described in the electric circuit diagram.
10. Check whether the wiring is correct.
11. Cover the contacts with the blind.
12. Insert the D01 fuses again.
13. Close the service lid.
14. Lock in and turn on system power.

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8.3.7 How to Replace the IR Cut Filter of the Illumination Module

IR cut filters are used in bright field illumination only.

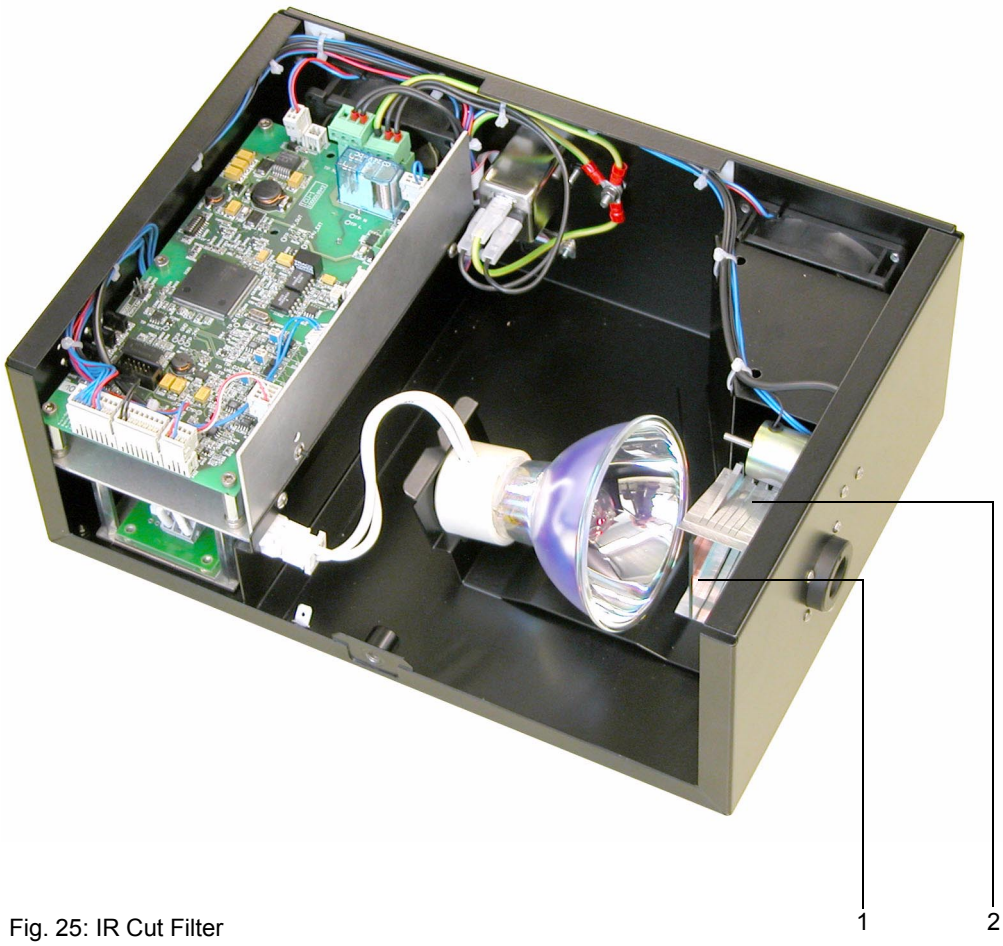

Fig. 25: IR Cut Filter

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the IR cut filter:

1. Turn off and lock out system power.
2. Open the lid of the illumination module by turning the quarter turn fastener.
3. Remove the lid of the illumination module.

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4. **Fig. 25:** Remove the old IR cut filter (**1**) from the filter holder (**2**).
5. Install the new IR cut filter in the same position in the filter holder as the old one. Make sure that the coated side of the IR cut filter faces the HQI lamp.
6. Install the lid of the illumination module.
7. Close and lock the lid with the quarter turn fastener.
8. Lock in and turn on system power.

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8.3.8 How to Replace the Temperature Sensor

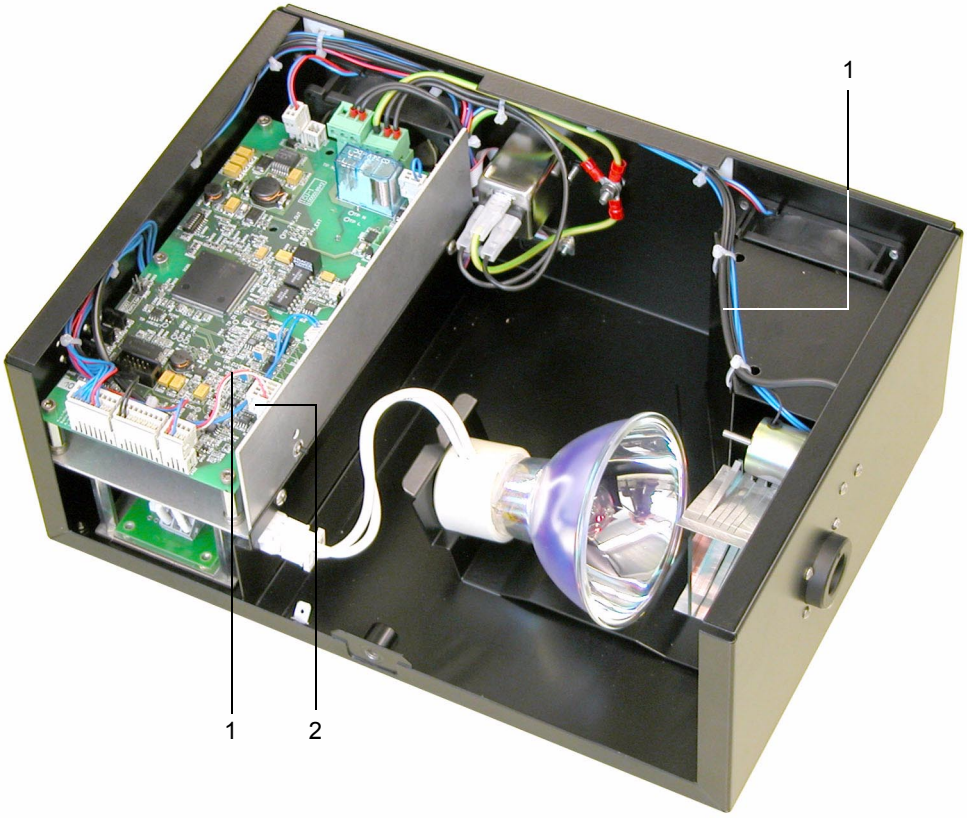

Fig. 26: Temperature Sensor (Analog Input Cable)

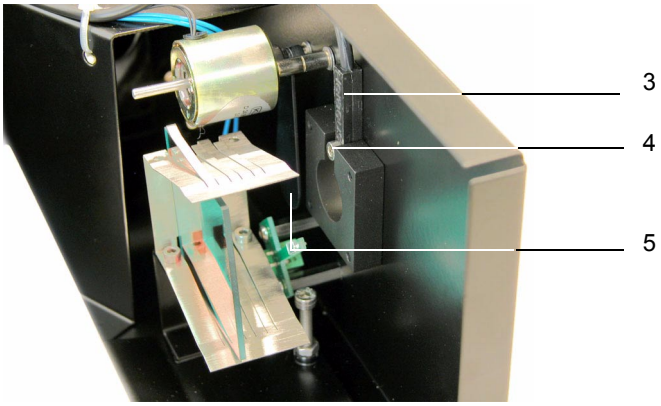

Fig. 27: Temperature Sensor

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Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the temperature sensor:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module.
4. Carefully unscrew the four mounting screws that connect the illumination module to the lamp box. Make sure the illumination module does not fall off.
5. Take the illumination module out of the lamp box.
6. Unfasten the quarter turn fastener and remove the service lid.
7. **Fig. 26:** Disconnect the analog input cable (**1**) for the temperature sensor from the ICU.
8. Take the analog input cable out. To do so you have to remove some cable ties.
9. **Fig. 27:** Remove the temperature sensor (**3**) by undoing its fastening screw (**4**).
10. Install the new temperature sensor and fasten it with the screw.
11. Check whether the shutter blade (**5**) can freely move into "closed" position.
12. **Fig. 26:** Run the sensor's analog input cable (**1**) towards the input connector (**2**) on the ICU and fasten it with cable ties and clamps.
13. Connect the analog input cable to the connector on the ICU.
14. Insert the lid and fasten the quarter turn fastener.
15. Insert the illumination module into the lamp box and fasten the mounting screws.
16. Connect the CAN bus cable.
17. Connect the mains supply.
18. Close the service lid of the lamp box.
19. Lock in and turn on system power.

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8.3.9 How to Replace the Line Connector

Danger

HAZARDOUS VOLTAGE

Danger of electric shock. Turn off and lock out system power before servicing.

Danger

BRIGHT LIGHT

The HQI lamp emits very bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the line connector:

1. Turn off and lock out system power.
2. Open the servicing lid of the lamp box.
3. Disconnect the mains supply cable and the CAN bus cable of the illumination module.
4. Carefully unscrew the four mounting screws that connect the illumination module to the lamp box. Make sure the illumination module does not fall off.
5. Take the illumination module out of the lamp box.
6. Unfasten the quarter turn fastener and remove the service lid.
7. Remove the cable sockets from the filter plug.
8. Loosen the filter plug by removing the strap and the screws.
9. Remove the old filter plug.
10. Insert the new filter plug.
11. Fasten the filter plug and insert the strap.
12. Connect the cable sockets. Make sure to connect the ground wire to the correct port.
13. Insert the lid and fasten the quarter turn fastener.
14. Insert the illumination module into the lamp box and fasten the mounting screws.
15. Connect the CAN bus cable.
16. Connect the mains supply.
17. Close the service lid of the lamp box.
18. Lock in and turn on system power.

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9 Troubleshooting

9.1 How to Detect That an Error Occurred/ Is About to Occur

The operator recognizes warning and error states in two different ways:

- Event message in **Event Log Viewer** (see Section 9.1.1 on page 59)
- **Red status LED** on module (see Section 9.1.2 on page 60)

9.1.1 Event Log Viewer

table 5 lists the events caused by the illumination modules. For critical, error and warning events, you can find actions. The table also applies to the fluorescent lamp.

ID	Description	Severity	Explanation	Action
220060	Light intensity too low on illumination module x. Current intensity: y.	Error	Intensity is lower than LIGHT_GROUP_ INTENSITY_ERROR_ THRESHOLD_MIN.	Check parameter settings. Check HQI lamp's position. Replace the HQI lamp.
220061	Light intensity too high on illumination module x. Current intensity: y.	Error	Intensity is higher than LIGHT_GROUP_ INTENSITY_ERROR_ THRESHOLD_MAX.	Check parameter settings. Check HQI lamp's position. Check intensity sensor.
220062	Temperature threshold x exceeded on illumination module y.	Critical	Illumination module is overheating. Temperature is higher than LIGHT_GROUP_ TEMPERATURE_ THRESHOLD_MAX	See Section 9.2.1 on page 63.
220063	Operating time exceeded on illumination module x. Current operation time: y.	Warning	Lamp's operating hours reached the LIGHT_ GROUP_OPERATING_ TIME_WARNING_ THRESHOLD.	See Section 9.2.2 on page 63.
220064	Operating time exceeded on illumination module x. Current operation time: y.	Error	Lamp's operating hours reached the LIGHT_ GROUP_OPERATING_ TIME_ERROR_ THRESHOLD.	See Section 9.2.2 on page 63.

Table 5: Event Messages

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ID	Description	Severity	Explanation	Action
220065	Illumination module NodeID: 0Xxx: S/N: yyyy, Rev: zzz is not responding.	Error	No communication between illumination module and **Line Scan Controller** via CAN bus is possible. xx: CAN node ID of the illumination module yyyy: serial number of the illumination module (serial number of the ICU within the illumination module) zzz: revision of the ICU firmware	See Section 9.2.3 on page 64.

Table 5: Event Messages

9.1.2 Status LEDs

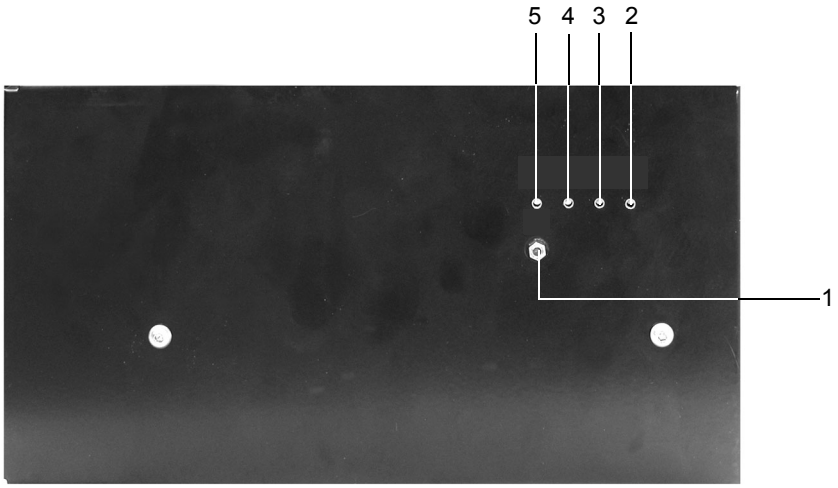

Fig. 28: Status LEDs

(1) Status reset button. (To be pressed before restarting the illumination module after an error has occurred and its cause is removed.)

(2) For future use.

(3) **Operating hours** of HQI lamp.

(4) **Temperature** close to the fiber connector.

(5) **Intensity** of HQI lamp.

A **green LED** signals that the status is OK. A **red LED** signals a critical condition (see Sections 9.1.2.1 on page 61 to 9.1.2.3 on page 62).

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9.1.2.1 Operating Hours

LED	Status	Action
Red	HQI lamp operating hours have reached error threshold of 6,000 hours	Replace HQI lamp immediately. See Section 8.2.3 on page 38.
Red, flashing	HQI lamp operating hours have reached warning threshold of 5,000 hours	Replace HQI lamp in the near future. See Section 8.2.3 on page 38.
Green	HQI lamp operating hours below warning threshold of 5,000 hours	No action required.

Table 6: Indications of Operating Hours LED

9.1.2.2 Temperature

To protect the illumination module from overheating, the illumination module is equipped with a temperature sensor (**1**) close to the fiber connector.

If an overheating condition is present, this sensor triggers a switch off of the HQI lamp and sends error messages to the operator and the SENSIC application.

Additionally, the temperature status LED (**2**) on the rear side of the illumination module turns red. This status LED indicates the following temperature conditions (table 7).

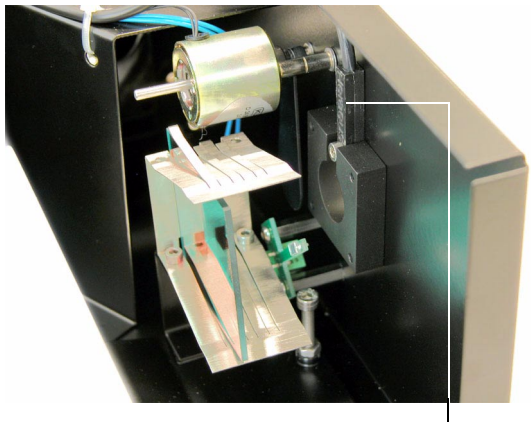

Fig. 29: Temperature Sensor

LED	Status	Action
Red	Temperature level has become critical. Illumination module has switched off.	Refer to Section 9.2.1 on page 63.
Red, flashing	Temperature has been critical, but has cooled down by now.	Find out the cause for the temperature increase and rectify. Acknowledge that the illumination module is OK by pressing the status reset button (Fig. 28 (1)).
Green	Temperature level OK.	No action required.

Table 7: Indications of Temperature LED

9.1.2.3 Intensity

LED	Status	Action
Red	Intensity **not** OK, i.e. intensity is either beyond the maximum or the minimum threshold parameter	Check whether the parameters in the parameter set manager are correct. Refer to section "Parameter Settings" on page 21.
Green, flashing	HQI lamp is warming up. Hence, it has not yet reached the intensity defined by the threshold parameters	No action required.
Green	Intensity OK, i.e. intensity is within the threshold parameters defined in **Parameter Set Manager**	No action required.

Table 8: Indications of Intensity LED

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9.2 HQI Lamp Switched Off

An HQI lamp can switch off for the following reasons:

- Overheating (Temperature Error) (page 63)
- Operating Hours (Operating Time Error) (page 63)
- HQI Lamp Cannot Be Switched On (page 65)

Check whether one of the above mentioned reasons applies.

9.2.1 Overheating (Temperature Error)

If the temperature sensor switched off the lamp (see Section 9.1.2.2 on page 61), proceed as follows.

To remedy temperature error:

Danger

BURN HAZARD

Due to the powerful HQI lamp, components of the illumination module can get very hot. You can suffer serious burns if you do not let the illumination module cool down for **30 minutes** before touching its components.

1. Let the HQI lamp cool down for 30 minutes.
2. Verify the following:
   - Check whether the value of the parameter for the maximum temperature is 100° C.
   - Check for obstructions in the cooling air flow of fan no. 2. Remove obstructions if required.
   - Check whether fan no. 2 works properly. Replace fan no. 2 if required.
3. You have to press the reset button ((**3**) in Fig. 28 on page 60) on the rear side of the illumination module, before you can restart it.

9.2.2 Operating Hours (Operating Time Error)

If the **Operating Time** warning after 5,000 operating hours of the HQI lamp is ignored and the lamp is not replaced, the error message **Operating Time** appears after 6,000 operating hours. This indicates, that the HQI lamp now definitely has to be replaced. Otherwise there will be an error due to lamp failure.

To remedy operating time error:

1. Change the HQI lamp as described in Section 8.2.3 on page 38.

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9.2.3 HQI Module Not Responding

If communication between illumination module and **Line Scan Controller** via CAN bus is not possible, check the following:

Check	Result	Action
Whether status LEDs of the illumination module are off.	Power supply of the illumination module is disconnected.	1. Reestablish power supply. 2. Restart **Line Scan Controller** (not mandatory).
Whether the CAN bus cable is connected properly. With the aid of the PeakCanView software, check whether CAN messages can be sent to the illumination module and whether the module is responding correctly.	CAN bus connection between line scan PC (IPC) and illumination module is disrupted.	1. Reestablish CAN bus connection. 2. Restart **Line Scan Controller** (not mandatory).
Which event messages occurred before illumination module(s) logged off. With the aid of the PeakCanView software, check whether CAN messages can be sent to the illumination module and whether the module is responding correctly.	Illumination module(s) logged off due to high bus load.	1. If applicable, remove causes for event messages. 2. Close **Line Scan Controller**. 3. Start the PeakCanStat software and, if applicable, close all CANLib objects. 4. Restart **Line Scan Controller**.
-	HQI illumination module is defective.	1. Disconnect CAN bus connection of the potentially defective illumination module. 2. To avoid this problem from arising again, the defective illumination module must be replaced.

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9.2.4 HQI Lamp Cannot Be Switched On

If the HQI lamp cannot be switched on, check the following:

Check	Result	Action
Whether lamp status is **not** "cooling down" (LED blinks slowly)	Lamp status is "cooling down".	Wait until HQI lamp has cooled down (status LED is off) and switch the HQI lamp on again.
Whether operating time of the HQI lamp has expired.	Operating time is higher than the error operating time.	Replace respective HQI lamp.
Whether a short flash of light can be seen when the HQI lamp is switched on.	A short flash of light can be seen.	The cabling to the HQI lamp's power supply unit may be defective. Check the cables from the power supply unit to the HQI bulb. Replace the power supply unit if required.

9.3 Shutter Doesn't Work

If the shutter does not work, check the following:

Check	Result	Action
Whether shutter can move freely	Shutter does not move freely	Adjust shutter
Whether voltage is applied, proceed as follows: Switch shutter on via **Service** dialog box. Measure voltage on corresponding digital output port.	Voltage on corresponding digital output port is > 20 V. No voltage on corresponding digital output port.	Replace rotary solenoid. Replace ICU.

9.4 How to Set Parameters from a Notebook

Normally, you carry out all parameter settings in the machine parameter set in **Parameter Set Manager**. If one of the following problems occurs and you cannot find the reason, you should try to modify parameter settings by sending CAN messages from your notebook:

- Problems with intensity control
- Problems with CAN bus communication

See Section 9.4.1 on page 66 for general instructions on how to send CAN bus messages. In Section 9.4.2 on page 67, you can find a list of the parameters that can be changed.

To calibrate the illumination module use a notebook PC.

9.4.1 How to Send CAN Bus Messages from a Notebook

To send CAN bus messages from your notebook PC to the illumination module, you may use the USB-CAN Bus Adaptor in combination with the "PCAN View" software.

To establish communication between your notebook PC and the illumination module, proceed as follows.

To establish communication:

1. Disconnect the CAN bus cable from the illumination module.
2. Connect a USB CAN bus adaptor with another CAN bus cable to the illumination unit. Alternatively, remove one of the terminators from the CAN bus and connect the USB CAN bus adaptor instead.
3. Send and receive CAN messages using the "PCAN View" software.

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9.4.2 Parameter Settings via CAN Bus

The following parameters can be set via CAN messages:

- Operating Time Warning (67)
- Operating Time Error (67)
- Temperature Error (68)
- Intensity (68)

To store or restore parameter changes, see Sections 9.4.2.5 on page 69 and 9.4.2.6 on page 69.

9.4.2.1 Operating Time Warning

The "operating time" warning message informs the operator that the estimated operating time of the HQI lamp is about to expire. To grant a certain time window where the HQI lamp can be changed before it actually breaks down, the parameter value for "warning operating time" is shorter than the actual estimated operating time. Thus idle time due to unexpected breakdown of the HQI lamp can be kept to an absolute minimum.

Recommended warning parameter value = 1388 h (i.e. 5,000 h)

To define this parameter, enter the following message:

ID	Length	Message
600 + node ID	8	29 00 52 02 LB HB 00 00

9.4.2.2 Operating Time Error

If the HQI lamp is not changed within a certain period of time after the "operating time" warning message was displayed, an operating time error message will occur. This message informs the operator that there will be an error due to brake down of the HQI lamp if it is not immediately replaced.

Recommended error parameter value = 1770 h (i.e. 6,000 h)

To define this parameter, enter the following message:

ID	Length	Message
600 + node ID	8	29 00 52 03 LB HB 00 00

For details on how to proceed when this error has occurred, refer to Section 9.2.2 on page 63.

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9.4.2.3 Temperature Error

To protect the illumination module from overheating, a parameter for a trigger temperature of 100° C for the temperature sensor must be defined. When this critical temperature is reached, the temperature sensor triggers the following actions:

- The status LED turns red,
- the respective HQI lamp is switched off,
- an error message is sent via the CAN bus,
- an error message is sent to the SENSIC application and displayed in **Event Log Viewer**.

To set the parameter for the temperature error message, enter the following message:

ID	Length	Message
600 + node ID	8	2F 00 60 02 LB HB 00 00

The temperature is given in increments of 0.1° C, i.e. 100° C is obtained by entering 03E8h.

For details on how to proceed when this error has occurred, refer to Section 9.2.1 on page 63.

9.4.2.4 Intensity

To set the parameters for the light intensity of the HQI lamp, send the following CAN messages:

ID	Length	Message
600 + node ID	8	2B 00 51 index LB HB 00 00

The following parameter values are defined by "index":

Index	Parameter values
2	sets the intensity target value in integers
3	sets the minimum threshold
4	sets the maximum threshold
5	sets the sampling time in milliseconds. Setting this parameter to "0" switches the closed loop control off. The parameter of index 2 is sent to the control output port
6	Starting time in seconds. When this period of time has elapsed, the closed loop control is started.
7	linear term of the closed loop control
8	integral term of the closed loop control
9	cool down time of the illumination module in seconds. The illumination module cannot be restarted before the cool down time has elapsed

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To return the parameter values given by the index, send this message:

ID	Length	Message
600 + node ID	8	40 ID 00 51 index 00 00 00 00

9.4.2.5 How to Store Parameter Changes

Changes to the parameters are lost once the power is shut off. To save changes permanently, send the following message:

ID	Length	Message
600 + node ID	8	23 10 10 04 73 61 76 65

9.4.2.6 How to Restore Default Parameters

To undo changes to the parameters and to restore the default parameters, send the following message:

ID	Length	Message
600 + node ID	8	23 11 10 04 6C 6F 61 64

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9.4.3 Boot Up Message

When the power is switched on, the ICU boots up in pre operational mode. On booting up, the illumination module automatically returns the boot up message. The message below returns the status on request:

ID	Length	Message
600 + node ID	8	40 CO 02 10 00 00 00 00

9.4.4 HQI Lamp and Shutter Control Using Process Data Objects (PDO)

In operational mode, the illumination module can be accessed via R-PD01 and T-PD01 for service purposes. Using R-PD01 you control HQI lamp and shutter with the following messages:

To switch HQI lamp on/off:

ID	Length	Message	Action
200 + node ID	1	00	switch off HQI lamp
200 + node ID	1	01	switch on HQI lamp with open shutter
200 + node ID	1	03	switch on HQI lamp with closed shutter

To view status of the illumination module:

ID	Length	Message	Checkbox
180 + node ID	1	00	RTR

To switch between operational mode and pre operational mode:

ID	Length	Message	Action
000 + node ID	2	01	switch to operational mode
000 + node ID	2	80	switch to pre operational mode

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Appendix A Electric Service Documentation (CD00115604)

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Operating Voltage	:	230V 50/60Hz
Control Voltage	:	
Rated Current	:	ca 1A
Rated Current Of Fuse	:	max 10A

Electrical-Documentation

Project : HQI light module

Documentnumber : CD 001156xx

drawn with ELCAD (R)

c				Date	03.06.2004		BASLER Vision Technologies	cd00115604		=
b				Drawn				HQI light module		+
a				Checked	P.Günter			1 Cover page		Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		1 Sh.

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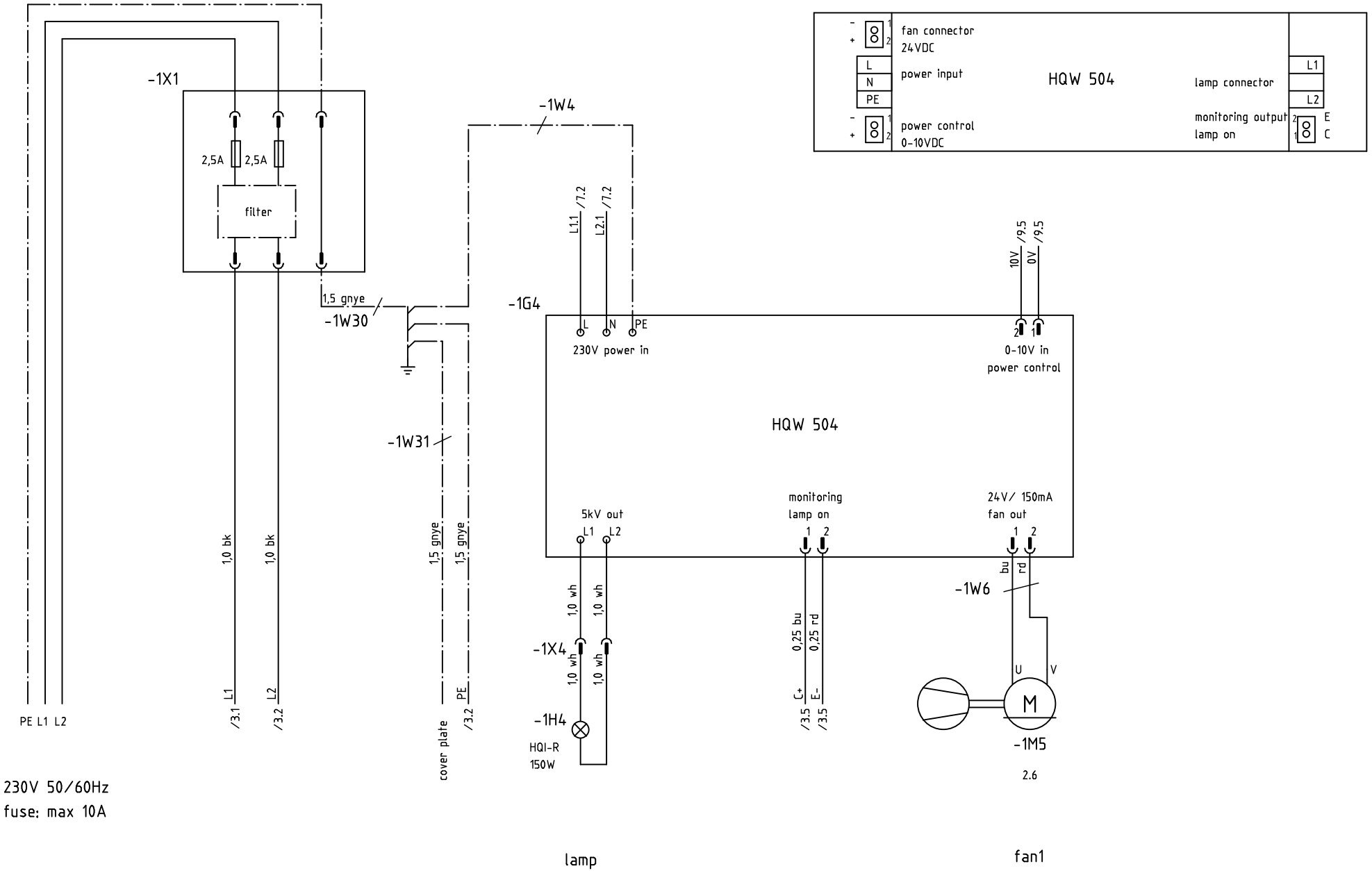
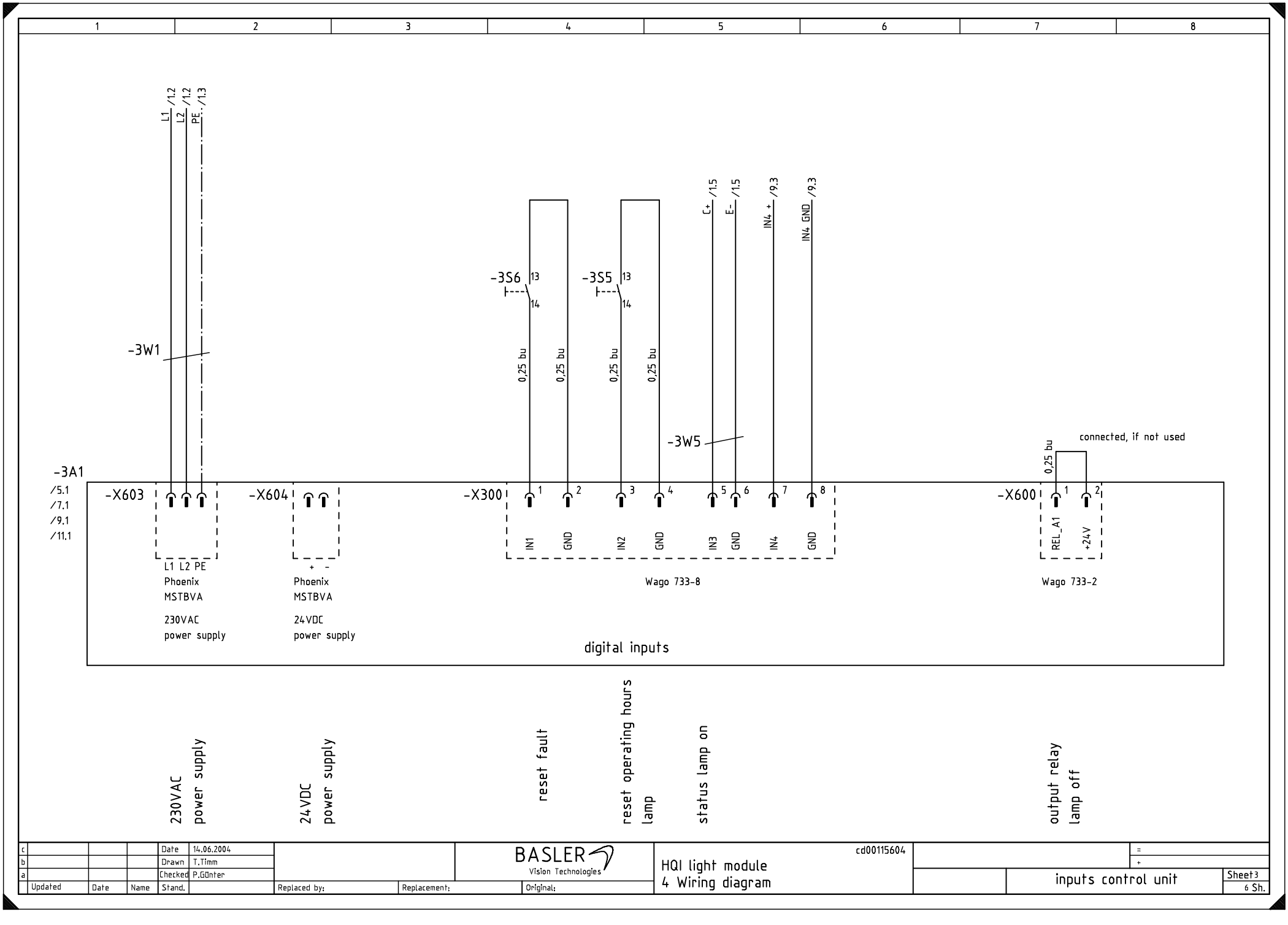
1st Notation	2nd Notation	Sheet	Description	Date	Special remarks
HQI light module	1 Cover page	1		03.06.2004	
HQI light module	2 Contents	1		11.11.2004	
HQI light module	4 Wiring diagram	1	power supply	19.11.2003	
HQI light module	4 Wiring diagram	3	inputs control unit	14.06.2004	
HQI light module	4 Wiring diagram	5	inputs control unit	15.06.2004	
HQI light module	4 Wiring diagram	7	outputs control unit	16.06.2004	
HQI light module	4 Wiring diagram	9	outputs control unit	16.06.2004	
HQI light module	4 Wiring diagram	11	outputs control unit	25.06.2004	
HQI light module	6 Plan of structure	20	box	30.07.2004	
HQI light module	6 Plan of structure	22	box	11.08.2004	
HQI light module	6 Plan of structure	23	box	11.11.2004	
HQI light module	6 Plan of structure	25	electronic unit	19.11.2003	
HQI light module	7 Partlist	1		15.04.2005	
HQI light module	7 Partlist	2		15.04.2005	
HQI light module	7 Partlist	3		15.04.2005	
internal documents	History of changes	1		06.02.2002	
internal documents	Label	1		11.08.2004	
internal documents	Order list	1		15.04.2005	
internal documents	Order list	2		15.04.2005	
internal documents	Order list	3		15.04.2005	

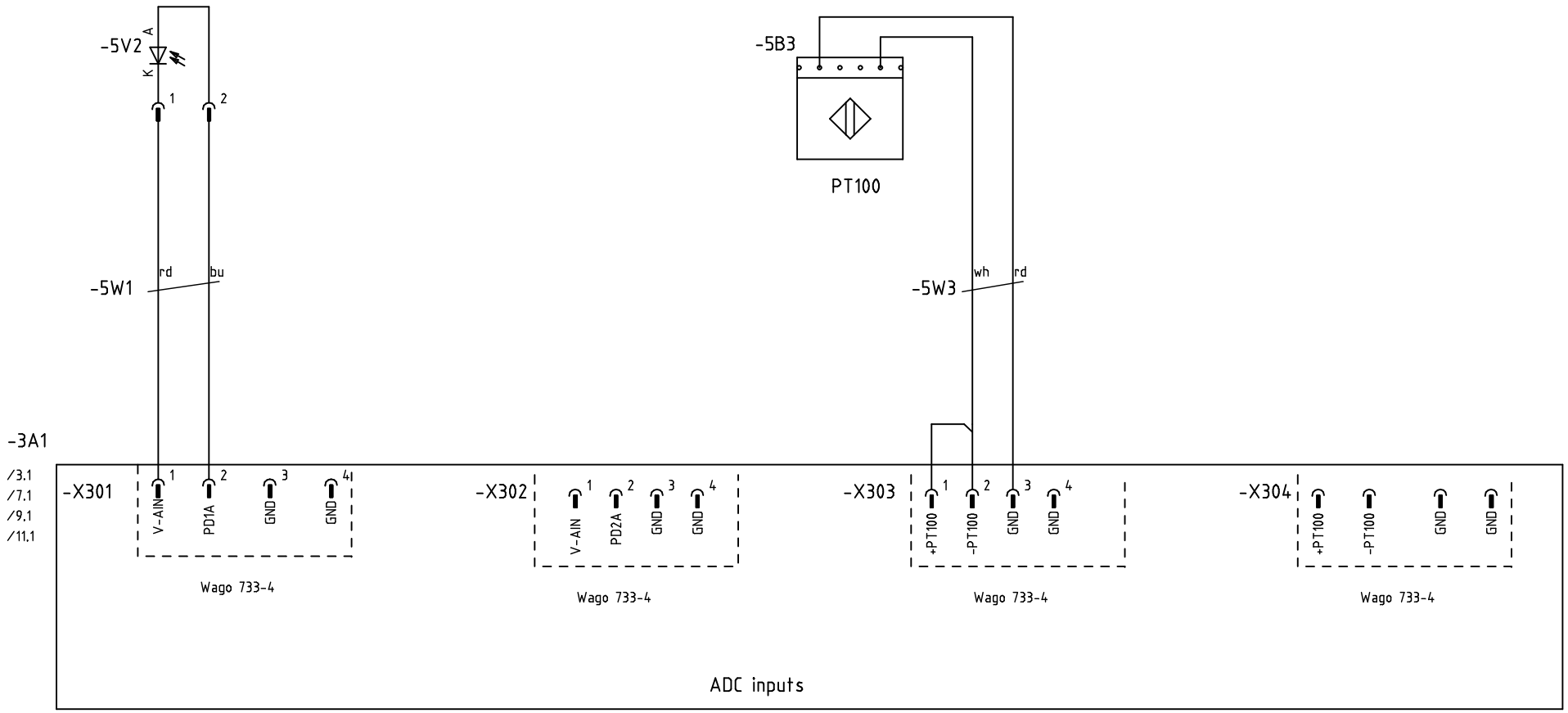
c				Date	18.04.2005		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked				2 Contents	Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	1 Sh.



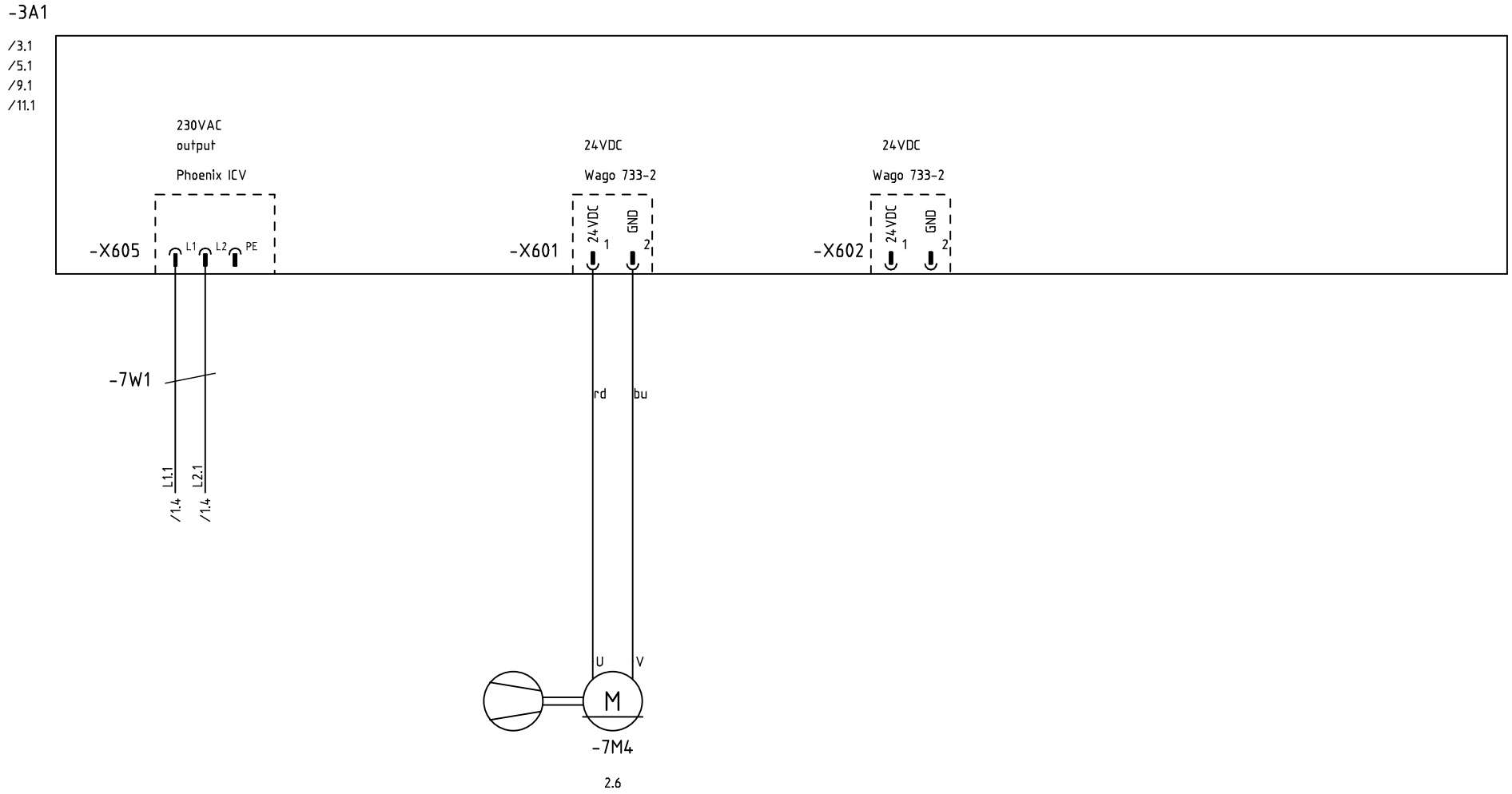
c				Date	19.11.2003		BASLER Vision Technologies	HQI light module 4 Wiring diagram	cd00115604	=	
b				Drawn	T.Timm					+	
a				Checked	P.Günter					power supply	Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:			6 Sh.



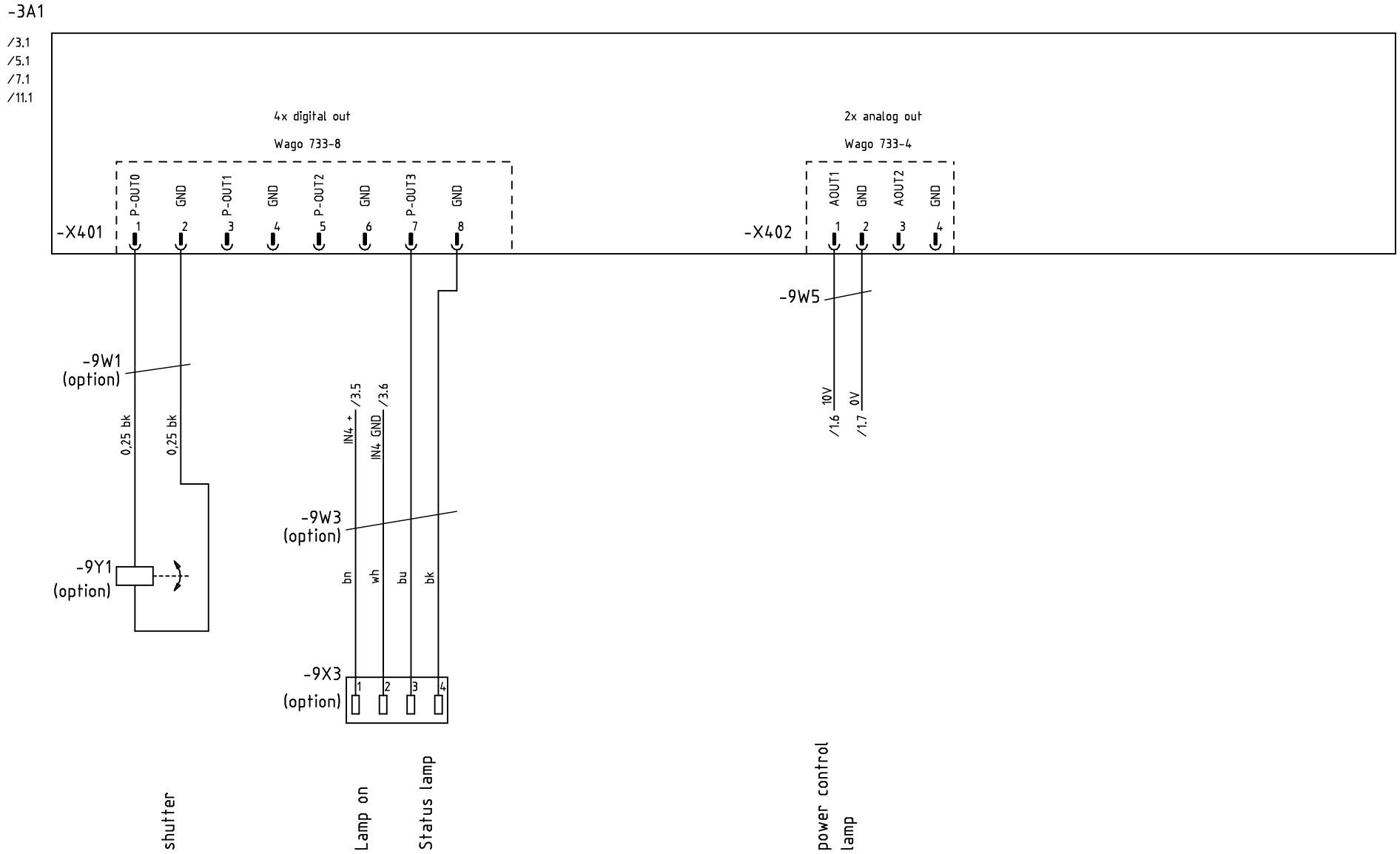
c				Date	14.06.2004	BASLER Vision Technologies	cd00115604	=	
b				Drawn	T.Timm		HQI light module	+	
a				Checked	P.Günter		4 Wiring diagram	inputs control unit	Sheet 3
	Updated	Date	Name	Stand.		Replaced by: / Replacement: / Original:			6 Sh.



c				Date	15.06.2004		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked	P.Günter			4 Wiring diagram	inputs control unit
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 5 / 6 Sh.



c				Date	16.06.2004		BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm			HQI light module		+
a				Checked	P.Günter			4 Wiring diagram		
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	outputs control unit	Sheet 7 / 6 Sh.



c				Date	16.06.2004		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked	P.Günter			4 Wiring diagram	outputs control unit
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 9 of 6 Sh.

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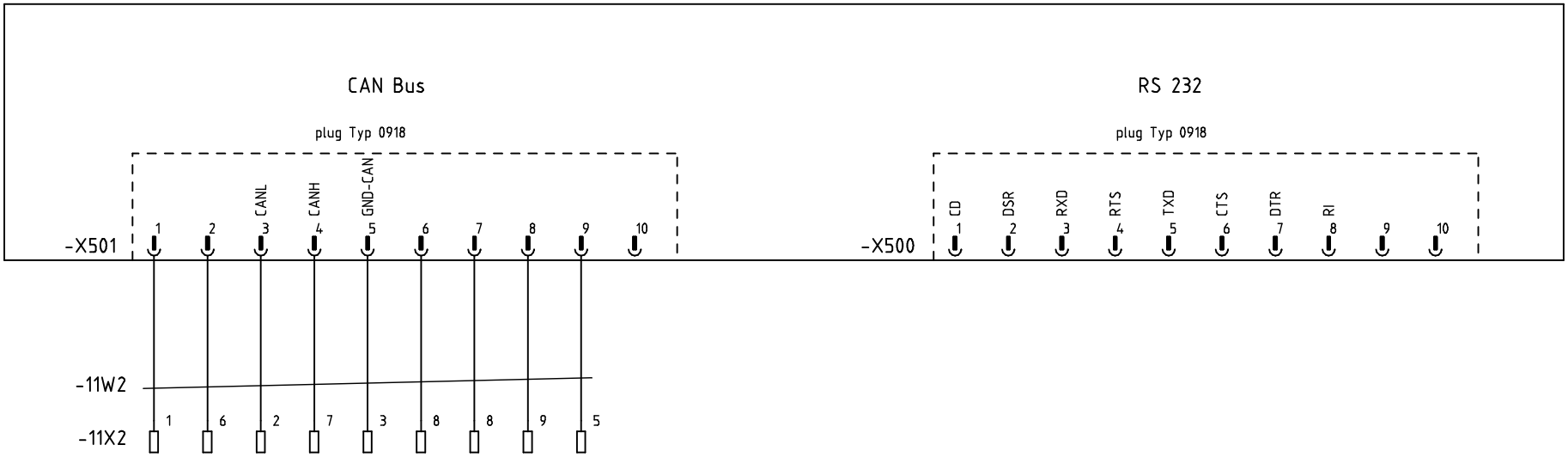
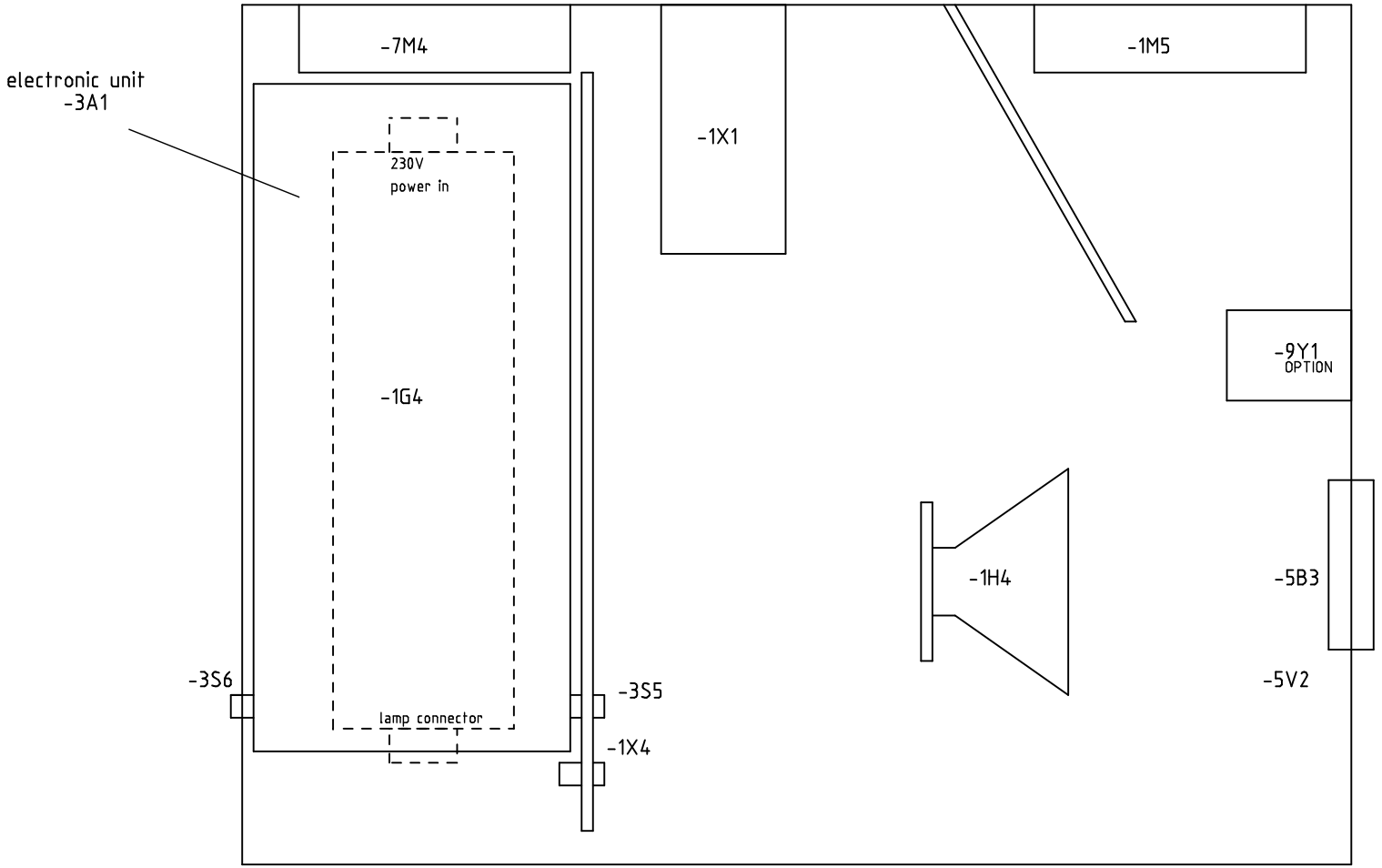
/3.1
/5.1
/7.1
/9.1

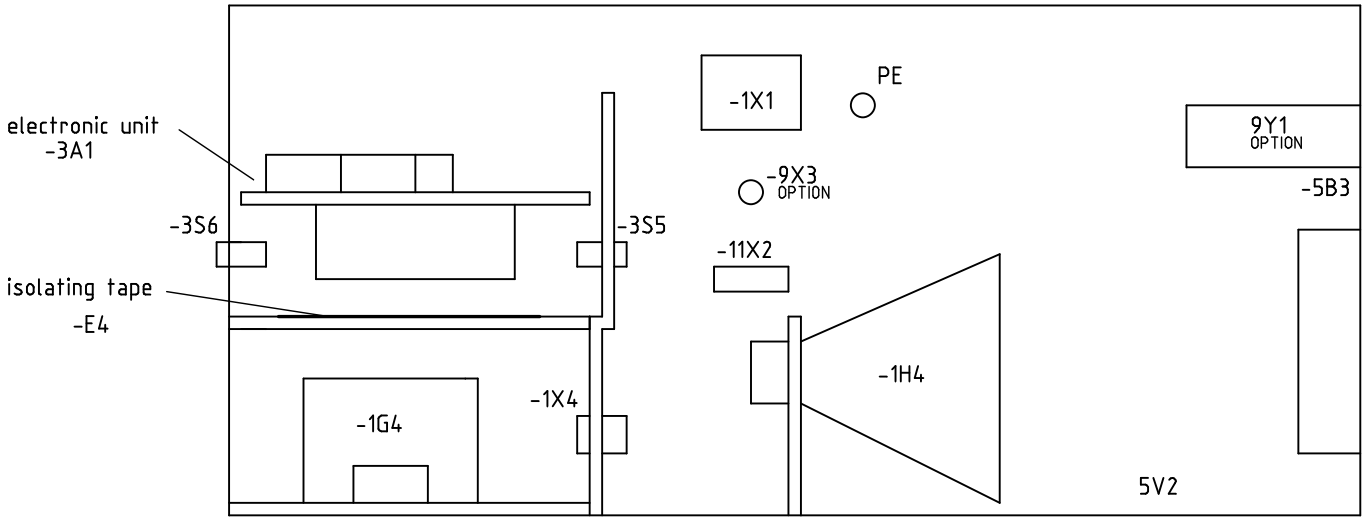


c				Date	25.06.2004		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked	P.Günter			4 Wiring diagram	outputs control unit
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 11 / 6 Sh.



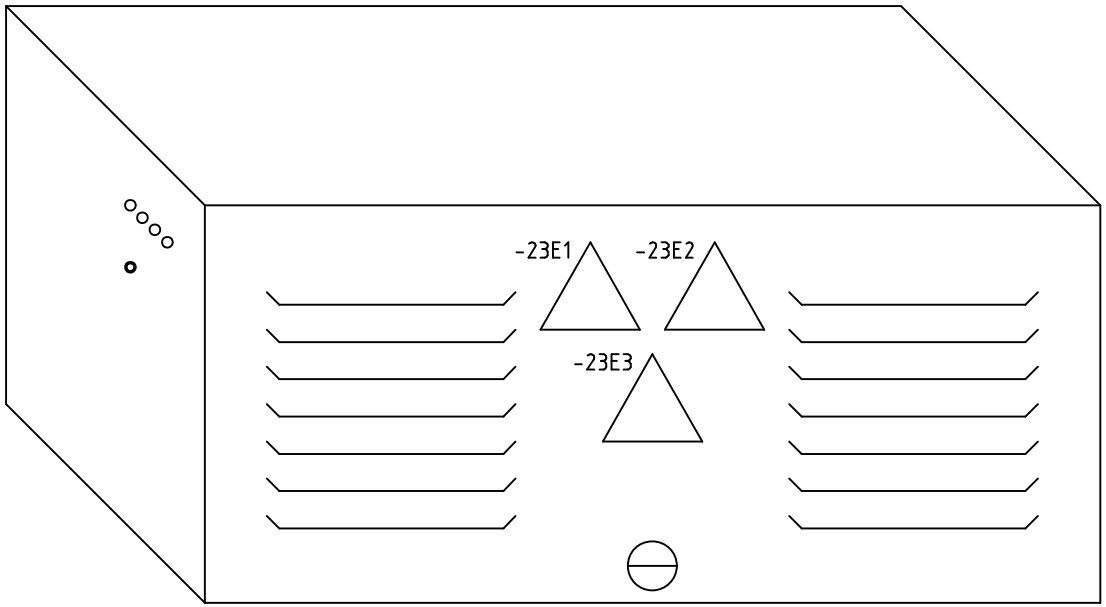
top view

c				Date	30.07.2004		BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm			HQI light module		+
a				Checked	P.Günter			6 Plan of structure	box	Sheet 20
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		4 Sh.



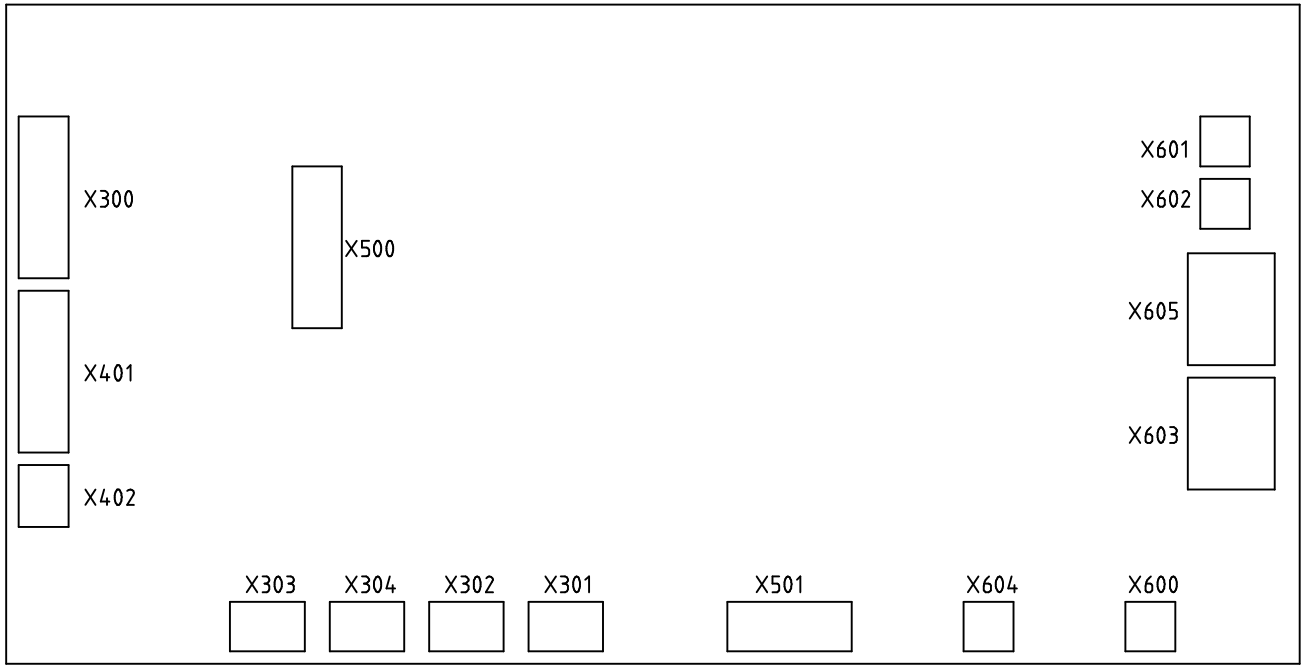
side view

c				Date	11.08.2004		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked	P.Günter			6 Plan of structure	box
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 22 / 4 Sh.



c				Date	11.11.2004		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			HQI light module	+
a				Checked	P;Günter			6 Plan of structure	box
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 23 / 4 Sh.

-3A1



c				Date	19.11.2003		BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm			HQI light module		+
a				Checked	P.Günter			6 Plan of structure		Sheet 25
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	electronic unit	4 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
1	1.00	1000018739	EVG HQW-504	-1G4	=/1.4	Hansmann
	St					EVG HQW-504T
2	1.00	1000018738	Lamp HQI-R 150W/NDL	-1H4	=/1.4	OSRAM
	St					HQI-R 150W/NDL
3	1.00	1000019029	Fan with JST plug	-1M5	=/1.6	Basler
	St					cd001192xx
4	1.00	1000005618	Protection grid	-1M5	=/1.6	PAPST
	St					LZ32-4 o. SUNON;FG-08
5	1.00	1000019038	PE cable 230mm	-1W4	=/1.4	Basler
	St					CD001198xx
6	1.00		part of -1M5	-1W6	=/1.6	
	St					
7	1.00	1000019039	PE cable 130mm	-1W30	=/1.3	Basler
	St					CD001199xx
8	1.00	1000019040	PE cable 340mm	-1W31	=/1.3	Basler
	St					CD001200xx
9	2.00	1000002184	Miniature fuse, 5x20mm, 2.5A time-lag	-1X1	=/1.2	Schurter
	St					0001.2508
10	1.00	1000018947	IF filter bipol safed	-1X1	=/1.2	SCHAFFNER
	St					FN9260-4/06
11	1.00	1000018946	IEC fixing clip	-1X1	=/1.2	Bulgin
	St					KT0006
12	1.00	1000019043	Cable lamp 70mm	-1X4	=/1.4	Basler
	St					CD001203xx
13	1.00	1000018951	Subassembly, ICU, Ruleelectronics SENSIC	-3A1	=/3.1	Basler
	St					xx
14	1.00	1000019047	Reset switch 300mm	-3S5	=/3.4	Basler
	St					CD001196xx
15	1.00	1000019048	Reset switch 130mm	-3S6	=/3.4	Basler
	St					CD001196xx
16	1.00	1000019037	Cable power in	-3W1	=/3.1	Basler
	St					CD001197xx
17	1.00	1000019035	Cable JST-Wago 733-8 700mm	-3W5	=/3.5	Basler
	St					CD001195xx
18	1.00	1000019023	PT100 with cable	-5B3	=/5.4	Basler
	St					cd001190xx
19	1.00	1000018956	Board, GSI_CF V1.0, horizontal connector	-5V2	=/5.1	Basler
	St					xx
20	1.00	1000020490	Cable intensity sensor 850mm	-5W1	=/5.1	Basler
	St					CD001189xx

c				Date	15.04.2005	BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm		HQI light module		+
a				Contr.	P.GÜnter		7 Partlist		Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:	3 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
21	1.00		part of -5B3	-5W3	=/5.5	
	St					
22	1.00	1000019028	Fan with Wago plug	-7M4	=/7.4	Basler
	St					cd001191xx
23	1.00	1000005618	Protection grid	-7M4	=/7.4	PAPST
	St					LZ32-4 o. SUNON;FG-08
24	1.00	1000019041	Power cable 220mm	-7W1	=/7.1	Basler
	St					CD001201xx
25	1.00		part of 9Y1	-9W1	=/9.1	
	St					
26	500.00	1000001995	Wire LiY 0.25mm^2 BK	-9W3	=/9.3	Lapp Kabel
	mm					4126 001
27	500.00	1000001999	Wire LiY 0.25mm^2 BN	-9W3	=/9.3	Lapp Kabel
	mm					4126 003
28	500.00	1000005533	Wire LiY 0.25mm^2 BU	-9W3	=/9.3	Lapp Kabel
	mm					4126 002
29	500.00	1000001979	Wire LiY 0.25mm^2 WH	-9W3	=/9.3	Lapp Kabel
	mm					4126 105
30	1.00	1000019020	Cable JST-Wago 733-4 580mm	-9W5	=/9.5	Basler
	St					cd001193xx
31	1.00	1000020472	Flange connector, 4p, series 763	-9X3	=/9.3	BINDER
	St					09-3431-77-04
32	1.00	1000007501	Nut for M12 insert bush PG9	-9X3	=/9.3	Hirschmann
	St					ELST M PG9
33	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-9X3	=/9.3	PANDUIT
	St					PEL-4-Y2Y-10
34	1.00	1000018945	Rotary magnet D24-BOR 24VDC	-9Y1	=/9.1	Basler
						CD001194xx
35	1.00	1000019042	Cable CAN 210mm	-11W2	=/11.2	Basler
	St					CD001202xx
36	1.00	1000001790	D-SUB 9p connector,fl.cable,plast.term.	-11X2	=/11.2	Provertha
	St					IST 09 164 G2
37	1.00	1000001869	Mounting kit, D-SUB/through-hole mount	-11X2	=/11.2	Provertha
	St					5313 S 43 Y A002
38	1.00	1000001523	"Warning sticker: ""Temp above 40°C"""	-23E1	=/23.5	BRADY
	St					PIC 315-TRI 50-B7541
39	1.00	1000019674	Warning optical radiation	-23E2	=/23.5	BRADY
	St					
40	1.00	1000017880	Sticker, voltage,	-23E3	=/23.5	SETON
	St					1130283008

c				Date	15.04.2005	BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm		HQI light module		+
a				Contr.	P.GÜnter		7 Partlist		Sheet 2
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:	3 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
41	1.00		VM Tape	-E4	=/22.2	M3
	St					80-0500-4502-2
42	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X300	=/3.4	PANDUIT
	St					PEL-4-Y2Y-10
43	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X301	=/5.1	PANDUIT
	St					PEL-4-Y2Y-10
44	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X303	=/5.5	PANDUIT
	St					PEL-4-Y2Y-10
45	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X401	=/9.1	PANDUIT
	St					PEL-4-Y2Y-10
46	1.00	1000018955	connector Wago Micro 8p-f RM 2.5mm	-X401	=/9.1	Wago
	St					733-108
47	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X402	=/9.5	PANDUIT
	St					PEL-4-Y2Y-10
48	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X501	=/11.1	PANDUIT
	St					PEL-4-Y2Y-10
49	1.00	1000019049	Plug 2p, bridge	-X600	=/3.7	Basler
	St					CD001204xx
50	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X600	=/3.7	PANDUIT
	St					PEL-4-Y2Y-10
51	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X601	=/7.3	PANDUIT
	St					PEL-4-Y2Y-10
52	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X603	=/3.1	PANDUIT
	St					PEL-4-Y2Y-10
53	1.00	1000013049	Panduit labels PEL-2-Y2Y-10	-X605	=/7.1	PANDUIT
	St					PEL-4-Y2Y-10

c				Date	15.04.2005		BASLER Vision Technologies	cd00115604
b				Drawn	T.Timm			HQI light module
a				Contr.	P.Günter			7 Partlist
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:

=	
+	
Sheet 3	
3 Sh.	

Distributor :

Revision	Changed from:	Date of release:	Released from:	Description of modification:
01		11.08.2004	P.Günter	
02	P.Günter	08.09.2004	P.Günter	wiring diagram sheet 1,3,5,7 / plan of structure sheet 25
03	T.Timm	11.11.2004	P.Günter	wiring diagram sheet 5,9, plan of stukture sheet 23
04	M.Prüfer	15.04.2004	M.Prüfer	-9W3, -9X3, -X401 8pol. WAGO, PANDUIT Etiketten, -5W1

c				Date	06.02.2002		BASLER Vision Technologies	cd00115604		=
b				Drawn	T.Timm			internal documents		+
a				Checked				History of changes		Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		1 Sh.

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-1G4	-1H4	-1M5	-1M5	-1W4	-1W6	-1W30	-1W31	-1X1	-1X1
-1X1	-1X1	-1X4	-3A1	-3S5	-3S6	-3W1	-3W5	-5B3	-5V2
-5W1	-5W3	-7M4	-7M4	-7W1	-9W1	-9W5	-9Y1	-11W2	-11X2
-11X2	-E4	-X300	-X301	-X303	-X401	-X402	-X501	-X600	-X600
-X601	-X603	-X605							

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
	4.00		part of -1M5	-1W6,-5W3,-9W1,-E4	=/1.6	
	1.00	1000001523	"Warning sticker: ""Temp above 40°C"""	-23E1	=/23.5	BRADY
						PIC 315-TRI 50-B7541
	1.00	1000001790	D-SUB 9p connector,fl.cable,plast.term.	-11X2	=/11.2	Provertha
						IST 09 164 G2
	1.00	1000001869	Mounting kit, D-SUB/through-hole mount	-11X2	=/11.2	Provertha
						5313 S 43 Y A002
	500.00	1000001979	Wire LiY 0.25mm^2 WH	-9W3	=/9.3	Lapp Kabel
						4126 105
	500.00	1000001995	Wire LiY 0.25mm^2 BK	-9W3	=/9.3	Lapp Kabel
						4126 001
	500.00	1000001999	Wire LiY 0.25mm^2 BN	-9W3	=/9.3	Lapp Kabel
						4126 003
	2.00	1000002184	Miniature fuse, 5x20mm, 2.5A time-lag	-1X1	=/1.2	Schurter
						0001.2508
	500.00	1000005533	Wire LiY 0.25mm^2 BU	-9W3	=/9.3	Lapp Kabel
						4126 002
	2.00	1000005618	Protection grid	-1M5,-7M4	=/1.6	PAPST
						LZ32-4 o. SUNON;FG-08
	1.00	1000007501	Nut for M12 insert bush PG9	-9X3	=/9.3	Hirschmann
						ELST M PG9
	11.00	1000013049	Panduit labels PEL-2-Y2Y-10	-9X3,-X300,-X301	=/9.3	PANDUIT
						PEL-4-Y2Y-10
				-X303,-X401,-X402		
				-X501,-X600,-X601		
				-X603,-X605		
	1.00	1000017880	Sticker, voltage,	-23E3	=/23.5	SETON
						1130283008
	1.00	1000018738	Lamp HQI-R 150W/NDL	-1H4	=/1.4	OSRAM
						HQI-R 150W/NDL
	1.00	1000018739	EVG HQW-504	-1G4	=/1.4	Hansmann
						EVG HQW-504T
	1.00	1000018945	Rotary magnet D24-BOR 24VDC	-9Y1	=/9.1	Basler
						CD001194xx
	1.00	1000018946	IEC fixing clip	-1X1	=/1.2	Bulgin
						KT0006

c				Date	15.04.2005		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			internal documents	+
a				Contr.				Order list	Sheet1
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:	3 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
	1.00	1000018947	IF filter bipol safed	-1X1	=/1.2	SCHAFFNER
						FN9260-4/06
	1.00	1000018951	Subassembly, ICU, Ruleelectronics SENSIC	-3A1	=/3.1	Basler
						xx
	1.00	1000018955	connector Wago Micro 8p-f RM 2.5mm	-X401	=/9.1	Wago
						733-108
	1.00	1000018956	Board, GSI_CF V1.0, horizontal connector	-5V2	=/5.1	Basler
						xx
	1.00	1000019020	Cable JST-Wago 733-4 580mm	-9W5	=/9.5	Basler
						cd001193xx
	1.00	1000019023	PT100 with cable	-5B3	=/5.4	Basler
						cd001190xx
	1.00	1000019028	Fan with Wago plug	-7M4	=/7.4	Basler
						cd001191xx
	1.00	1000019029	Fan with JST plug	-1M5	=/1.6	Basler
						cd001192xx
	1.00	1000019035	Cable JST-Wago 733-8 700mm	-3W5	=/3.5	Basler
						CD001195xx
	1.00	1000019037	Cable power in	-3W1	=/3.1	Basler
						CD001197xx
	1.00	1000019038	PE cable 230mm	-1W4	=/1.4	Basler
						CD001198xx
	1.00	1000019039	PE cable 130mm	-1W30	=/1.3	Basler
						CD001199xx
	1.00	1000019040	PE cable 340mm	-1W31	=/1.3	Basler
						CD001200xx
	1.00	1000019041	Power cable 220mm	-7W1	=/7.1	Basler
						CD001201xx
	1.00	1000019042	Cable CAN 210mm	-11W2	=/11.2	Basler
						CD001202xx
	1.00	1000019043	Cable lamp 70mm	-1X4	=/1.4	Basler
						CD001203xx
	1.00	1000019047	Reset switch 300mm	-3S5	=/3.4	Basler
						CD001196xx
	1.00	1000019048	Reset switch 130mm	-3S6	=/3.4	Basler
						CD001196xx
	1.00	1000019049	Plug 2p, bridge	-X600	=/3.7	Basler
						CD001204xx
	1.00	1000019674	Warning optical radiation	-23E2	=/23.5	BRADY

c				Date	15.04.2005		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			internal documents	+
a				Contr.				Order list	Sheet 2
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:	3 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
	1.00	1000020472	Flange connector, 4p, series 763	-9X3	=/9.3	BINDER
						09-3431-77-04
	1.00	1000020490	Cable intensity sensor 850mm	-5W1	=/5.1	Basler
						CD001189xx

c				Date	15.04.2005		BASLER Vision Technologies	cd00115604	=
b				Drawn	T.Timm			internal documents	+
a				Contr.				Order list	Sheet 3
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:	3 Sh.

Revision History

Document Number	Date	Changes
AW000185**01**000	13 Feb 2007	Initial release version of this manual. Continued from DB00015106. For Basler SENSIC software version 9.0.0.0. General corrections or additions: • New Basler, Inc. address (back of front page). Telephone and fax numbers will remain the same. • Revised instructions in Section 8.2.3 on page 38.

Table 9: Revision History

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